INSTITUTE VISION

To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society.

INSTITUTE MISSION

To continuously strive for the overall development of students, educating them in a state of the art infrastructure, by retaining the best practices, people and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals.

DEPARTMENT VISION

To be a centre of excellence in teaching and learning to produce the competent & socially responsible professionals in the domain of Electrical & Electronics Engineering.

DEPARTMENT MISSION

I. To educate students with core knowledge of Electrical and Electronics Engineering to excel in their professional career.

II. To develop problem solving skills, professional skills and ethical values among the students for the betterment of mankind.

III. To prepare technically competent and socially responsible Electrical Engineer to serve the future needs of the society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

Graduates of the program will be able to

PEO1: Achieve successful professional career in Electrical Engineering and allied disciplines.

PEO2: Pursue higher studies and continuously engage in upgrading the professional skills.

PEO3: Demonstrate professional & ethical values, effective communication skills and teamwork to solve issues related to profession, society and environment.

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: Apply knowledge & competencies to analyze & design Electrical & Electronics Circuits, Controls and Power Systems, Machines & Industrial Drives.

PSO2: Use Software/Hardware tools for the design, simulation and analysis of Electrical and Electronics Systems.

Contents of III-SEM

1.0 Student Help Desk

Sl. No	Coordination Work	Contact Person	
		Faculty	Instructor
01	Attestations	Dr. B. V. Madiggond	-
02	Exam forms signature, Overall department administration, Counseling/interaction with Parents/Students.		
03	Research Centre Coordinator, Academic Coordinator		
04	Project Coordinator, KSCST Coordinator, Hobby & Mini Project Coordinator	Prof. S. D. Hirekodi	-
05	Mentorship Coordinator, GATE Coaching Coordinator	Prof. H. R. Zinage	-
06	Dept. Association Coordinator, Seminar Coordinator	Prof. S. G. Huddar	-
07	Website Coordinator, Professional Body (ISTE & IEEE) Coordinator, Alumni Coordinator	Prof. O. B. Heddurshetti	-
08	AICTE/VTU/NIRF Coordinator, Dept. News & Publicity Coordinator, AICTE Activity Coordinator	Prof. A. U. Neshti	-
10	Library Coordinator	Prof. A. U. Neshti	Shri. S. B. Beelur
11	IA & EMS Coordinator	Prof. K. B. Negalur	-
12	First Year Coordinator, News letter/Technical Magazine Coordinator	Prof. M. P. Yenagimath	-
14	TP Cell Coordinator, IIIC Cell, Internship Coordinator	Prof. P. I. Savadatti	--
13	Dispensary	Dr. Arun G. Bullannavar, Contact No. 9449141549	
Class Teacher			
15	4th Semester	Prof. A. U. Neshti	Shri. S. B. Beelur
16	6th Semester	Prof. O. B. Heddurshetti	Shri. V. M. Mutalik
17	8th Semester	Prof. H. R. Zinage	Shri. R. S. Bardol

2.0 Departmental Resources

Department of Electrical and Electronics Engineering was established in the year 1996 and is housedin a total area of **1339 Sq. Mtrs.**

2.1 Faculty Position

S.N.	Category	No. in position	Average experience
1	Teaching faculty	10	18 Y
2	Technical supporting staff	3	26 Y
3	Helper	2	20 Y

2.2 Major Laboratories

SL. No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs)
01	Electronics Lab	71	4,49,488.00
02	Operational Amplifier & Linear Integrated Lab		1,29,776.00
03	Power Electronics Lab	92	7,85,162.00
04	Control Systems Lab		2,14,127.00
05	Power System Simulation Lab	71	17,95,111.00
06	Computer Aided Electrical Drawing Lab		6,50,988.40
07	Microcontroller Lab / Digital Signal Processing Lab	72	5,94,122.00
09	Electrical Machines Lab	200	14,85,725.0
10	Relay & High Voltage Lab	94	11,72,383.00
11	Basic Electrical Engg. Lab	96	42,321.00
	Total	**696**	73,19,203.40

3.0 Faculty Details

S.N.	Faculty Name	Designation	Qualification	Area of specialization	Professional membership	Industry Experience (in years)	Teaching Experience (in years)	Contact Nos.
01	Dr. B. V. Madiggond	HOD/Prof.	Ph. D	Power Electronics	LMISTE, YHAI	-	30	9343454993
02	Prof. V. B. Dhere	Asst. Prof.	M. Tech, (Ph. D)	Electronics & Telecommunication	LMISTE, IMPARC	4	26	9886597573
03	Prof. S. D. Hirekodi	Asst. Prof.	M. Tech.	Power Electronics	LMISTE	1	23	9480849338
04	Prof. H. R. Zinage	Asst. Prof.	M. Tech.	Power System	LMISTE	-	23	9480849335
05	Prof. M. P. Yenagimath	Asst. Prof.	M. Tech (Ph. D)	VLSI & ES	LMISTE	1	17.5	9341449466
06	Prof. O. B. Heddurshetti	Asst. Prof.	M. Tech.	Power Electrics	LMISTE	1	16	9448420509
07	Prof. A. U. Neshti	Asst. Prof.	M. Tech.	Digital Electronics	ISTE	-	15	9538223362
08	Prof. K. B. Neglur	Asst. Prof.	M. Tech.	Industrial Electronics	LMISTE	-	10	9886644507
09	Prof. S. G. Huddar	Asst. Prof.	M. Tech.	Power System Engg.	LMISTE	-	10	9742066852
10	Prof. P. I. Savadatti	Asst. Prof.	M. Tech.	Digital Electronics	-	-	08	9964315436

4.0 Institute Academic Calendar

S J P N Trust's
Hirasugar Institute of Technology, Nidasoshi.
Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi
Recognized under 2(f) & 12B of UGC Act, 1956
Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE

IQAC
File I-11
AY:2023-24 (Even)
Rev: 01

ACADEMIC CALENDAR OF EVENTS-02 (CoE-02) OF IV& VI SEMs FOR THE AY: 2023-24

Ref: 1) VTU CoE Revised Notification No.: VTU/BGM/AC-MBA/2023-24/6901, Dated 27th March 2024
2) VTU Tentative Academic Calendar Notification No.: VTU/BOS/AC-PG-6th sem BE/2023-24 /239, Dated 15th April 2024

April -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

July-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Date	Events & Holidays
2nd April 2024	Technovision-24
9th April 2024	GH: Yugadi Festival
11th April 2024	GH: Kutub-A-Ramjan
22nd April, 2024	Commencement of IV Semester Classes
29th April, 2024	Commencement of VI Semester Classes
30th April 2024	Institute Sports Events
1st May 2024	GH: Labours Day
7th May 2024	GH: Lok Sabha Election
2nd -6th May 2024	Fun Week (Social & Cultural Activities)
8th May 2024	HSIT Shambhrama-24 & World- Red-Cross Day
9th May 2024	Graduation Day-24
10th May 2024	GH: Basav Jayanti/Akhsay Trutiya
13th May 2024	Final Year Project Exhibition
29th -31st May 2024	1st IA Test for IV & VI Sems.
31st May 2024	1st Feedback on Teaching-Learning (IV & VI Sems.)
5th June 2024	Display of 1st IA Test Marks of IV & VI Sems.
21st -22nd June 2024	Lab IA Test-I (IV & VI Sem. 2021 & 2022 Schemes)
21st June 2024	International Yoga Day
27th -29th June 2024	2nd IA Test for IV & VI Sems.
29th June 2024	2nd Feedback on Teaching-Learning (IV & VI Sems.)
3rd July 2024	Display of 1st IA Test Marks of IV & VI Sems.
17th June 2024	GH: Bakreed
3rd July 2024	International Plastic Bag Free Day
11th July 2024	World Population Day
15th July 2024	World Youth Skills Day
17th July 2024	GH: Last Day of Moharam
25th -27th July 2024	3rd IA Test for IV & VI Sems.
28th July 2024	World Nature Conservation Day
30th July 2024	Display of 3rd IA Test Marks of IV & VI Sems.
29th -30th July 2024	Lab IA Test-II (IV & VI Sem. 2021 & 2022 Schemes)
31st July 2024	Last Working Day of the VI Semester Classes
7th August 2024	Last Working Day of the IV Semester Classes
12th August 2024	International Youth Day
15th August 2024	GH: Independence Day Celebration
8th -17th August 2024	VTU IV Sem Practical Examinations
19th Aug. -12th Sept. 2024	VTU IV Sem Theory Examinations
1st -10th August 2024	VTU VI Sem Practical Examinations
12th Aug. -14th Sept. 2024	VTU VI Sem Theory Examinations
20th August 2024	Sadbhavna Diwas
26th August 2024	Women's Equality Day
16th Sept. 2024	Commencement of V Sem of AY: 2024-25

GH: General Holiday, LH: Local Holiday

Dr.S.N.Topannavar
IQAC Coordinator & Dean (Academics)

Dr.S.C.Kamate
Principal

Nidasoshi, Taq: Hukkeri, Dist: Belagavi, Karnataka - 591 236
Phone:+91-8333-278887, Fax:27[illegible]6, Web:www.hsit.ac.in, Mail:principal@hsit.ac.in

Page 1 of 2

5.0 Department Academic Calendar

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Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE

EEE
COE
2023-24 (Even)
Rev: 00

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGG.
CALENDAR OF EVENTS FOR THE IV & VI SEMESTER 2023-24 (Even)

Calendar

April -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

July -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	12
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

Date	Events & Holidays
2nd April 2024	Technovision-24
9th April 2024	GH: Yugadi Festival
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22nd April. 2024	Commencement of IV Semester Classes
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1st May 2024	GH: Labours Day
3rd May 2024	Fun Week-HSIT Shambhrama-24
7th May 2024	GH: LokSabha Election
8th May 2024	GraduationDay-24 & World Red Cross Day
9th May 2024	Final Year Project Exhibition
10th May 2024	GH: Basav Jayanti/Akhsay Trutiya
13th May 2024	Project Exhibition for VIII Sem
17th May 2024	Poster Presentation
24th May 2024	Speech Competition
29th -31st May 2024	1st IA Test for IV & VI Sem.
31st May 2024	1st Feedback on Teaching-Learning (IV & VI Sem)
5th June 2024	Display of 1st IA Test Marks of IV & VI Sem.
7th June 2024	Group Discussion
14th June 2024	Pick & Speak Competition
17th June 2024	GH: Bakreed
21st - 22nd June 2024	Lab IA Test-I (IV&VISem.2021 & 2022 Schemes)
21st June 2024	International Yoga Day
27th-29th June 2024	2nd IA Test for IV & VI Sems.
29th June 2024	2nd Feedback on Teaching-Learning (IV & VI Sem)
3rd July 2024	Display of 1st IA Test Marks of IV & VI Sem
5th July 2024	Mehandi Competition
12th July 2024	Face Painting Competition
3rd July 2024	International Plastic Bag Free Day
11th July 2024	World Population Day
15th July 2024	World Youth Skills Day
17th July 2024	GH: Last Day of Moharam
19th July 2024	Hair Style Competition
25th-27th July 2024	3rd IA Test for IV& VI Sem
28th July 2024	World Nature Conservation Day
30th July 2024	Display of 3rdIA Test Marks of IV & VI Sem
29th -30th July 2024	Lab IA Test-II (IV & VI Sem 2021 & 2022 Schemes)
31st July 2024	Last Working Day of the VI Semester Classes
7th August 2024	Last Working Day of the IV Semester Classes
12th August 2024	International Youth Day
15th August 2024	GH: Independence Day Celebration
8th-17th August 2024	VTU IV Sem Practical Examinations
19th Aug.-12th Sept. 2024	VTU IV Sem Theory Examinations
1st-10th August 2024	VTU VI Sem Practical Examinations
12th Aug.-14th Sept. 2024	VTU VI Sem Theory Examinations
20th August 2024	Sadbhavna Diwas
26th August 2024	Women's Equality Day
16th September 2024	Commencement of V Sem of AY: 2024-25

GH: General Holiday, LH: Local Holiday

Smt. S. G.Huddar
EESSA Coordinator

25.5.24
Dr. B. V. Madiggond
HOD

27/5/24
Dr. S. C. Kamate
Principal

Nidasoshi, Taq: Hukkeri, Dist: Belgaum, Karnataka - 591 236
Phone:+91-8333-278887, Fax:278886, Web: www.hsit.ac.in, Mail: principal@hsit.ac.in

6.0 Scheme of Teaching & Examination

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2023-24)

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration inhours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	BEE401	Electric Motors	EEE	3	0	0		03	50	50	100	3
2	PCC	BEE402	Transmission and Distribution	EEE	4	0	0		03	50	50	100	4
3	IPCC	BEE403	Microcontrollers	EEE	3	0	2		03	50	50	100	4
4	PCCL	BEEL404	Electric Motors lab	EEE	0	0	2		03	50	50	100	1
5	ESC	BEE405x	ESC/ETC/PLC	EEE	3	0	0		03	50	50	100	3
6	AEC/SEC	BEE456x	Ability Enhancement Course/Skill Enhancement Course- IV	EEE	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
7	BSC	BBOK407	Biology For Engineers	TD / PSB: BT, CHE,	3	0	0		03	50	50	100	3
8	UHV	BUHK408	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	MC	BNSK459	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK459	Physical Education (PE) (Sports andAthletics)	Physical EducationDirector									
		BYOK459	Yoga	Yoga Teacher									
									Total	**500**	**400**	**900**	**20**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering.

Ability Enhancement Course / Skill Enhancement Course - IV			
BEEL456A	Basics of VHDL Lab	BEEL456B	Sci Lab / MATLAB for Electrical and Electronic Measurements
BEEL456C	PCB Design Laboratory	BEEL456D	Aurdino & Rasberry PI Based Projects
Engineering Science Course (ESC/ETC/PLC)			
BEE405A	Electrical Power Generation and Economics	BEE405C	Engineering Materials
BEE405B	Op-Amp and LIC	BEE405D	Object Oriented Programming

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of degree.

Subject Title	**Electric Motors**		
Subject Code	BEE401	**CIE Marks**	50
Number of Lecture Hrs/Week	4	**SEE Marks**	50
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. Shivanand Hirekodi	**Designation:** Asst.Professor	**Experience:** 23Years
No. of times course taught:02 (including present)	**Specialization:** Power Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical & Electronics Engineering	I/II	Elements of Electrical Engineering

2.0 Course Objectives

1. To study the constructional features of Motors and select a suitable drive for specific application.
2. To study the constructional features of Three Phase and Single phase induction Motors.
3. To study different test to be conducted for the assessment of the performance characteristics of motors.
4. To study the speed control of motor by a different methods.
5. Explain the construction and operation of Synchronous motor and special motors.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

CO	Course Outcome	RBT Level	POs
C218.1	Explain the construction and operation, characteristics, testing of DC motors and determine losses and efficiency.	L3	PO 1,2,3,6,7,8,9,10,12
C218.2	Describe construction, operation, types and characteristics of three phase Induction motors.	L3	PO 1,2,3,6,7,8,9,10,12
C218.3	Determine the performance parameters of three Induction motor and discuss working of induction motor as induction generator.	L3	PO 1,2,3,6,7,8,9,10,12
C218.4	Discuss starting and speed control of three phase Induction motor and construction and working of different types of single phase Induction motors.	L3	PO 1,2,3,6,7,8,9,10,12
C218.5	Explain principle of operation, characteristics of synchronous and other motors.	L2	PO 1,2,3,6,7,8,9,10,12
Total Hours of instruction		**40**	

4.0 Course Content

Module-1

DC Motors: Construction and working principle. Back E.M.F and its significance, Torque equation, Classification, Characteristics of shunt, series & compound motors, Speed control of shunt motor, Application of motors.

Losses and Efficiency- Losses in DC motors, power flow diagram, efficiency, condition for maximum efficiency.

Testing of DC Motors: Direct & indirect methods of testing of DC motors- Swinburne's test, Field's test, merits and demerits of tests. 8 hours

Module-2

Three Phase Induction Motors: Concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring. Slip and its significance, Torque equation, torque-slip characteristic covering motoring, generating and braking regions of operation, Maximum torque.

8 hours

Module-3

Performance of Three-Phase Induction Motor: Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the equivalent circuit. Cogging and crawling. High torque rotors-double cage and deep rotor bars. Induction motor working as induction generator, construction and working of doubly fed induction generator.

8 hours

Module-4

Starting and Speed Control of Three-Phase Induction Motors: Need for starter. Direct on line, Star-Delta, and autotransformer starting. Rotor resistance starting. Speed control by frequency.

Single-Phase Induction Motor: Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors. Comparison of single phase motors and applications. 8 hours

Module-5

Synchronous Motor: Principle of operation, phasor diagrams, torque and torque angle, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condenser.

Other Motors: Construction and operation of Universal motor, AC servomotor, Linear induction motor PMSM, SRM and BLDC.

8 hours

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	V	Electrical machine design	Circle Diagram, Torque equation, starters
02	VII&VIII	Seminar and project	Knowledge of Machine and control techniques.

6.0 Relevance to Real World

SL No	Real World Mapping
01	Industrial Drives for different mills, Process control industries.
02	Application of special motors

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Lab and industrial visit.	Familiarization of real machine parts and its constructional features. Included animation slides demonstrating the working of various machines.
02	NPTEL	Video lectures

8.0 Books Used and Recommended to Students

Text Books and Reference Books
1. Electric Machines, D. P. Kothari, I. J. Nagrath, McGraw Hill, 4th edition, 2011.
2. Theory of Alternating Current Machines, Alexander Langsdorf, McGraw Hill, 2nd Edition, 2001.
3. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.
Additional Study material & e-Books
1. Electrical Machines, Drives and Power systems, Theodore Wildi, Pearson, 6th Edition, 2014
2. Electrical Machines, M.V. Deshpande, PHI Learning, 2013

3. Electric Machinery and Transformers, Bhag S. Guru at el, Oxford University Press, 3rd Edition, 2012
4. Electric Machinery and Transformers, Irving Kosow, Pearson, 2nd Edition, 2012
5. Principles of Electric Machines and power Electronics P.C.Sen Wiley 2nd Edition, 2013
6. Electrical Machines, R.K. Srivastava, Cengage Learning, 2nd Edition, 2013

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
http://www.electrical4u.com
https://nptel.ac.in
http:// acl.digimat.in/nptel/courses/video/108105017/108105017.html

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Electric apparatus magazine	https://electricalapparatus.wordpress.com/2016/06/30/electric-generator-up-and-running/
2	E drive magazine	http://www.e-driveonline.com/main
3	Motor magazine	https://www.motor.com/newsletters

11.0 Examination Note

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned.
- Three tests will be conducted for 25 marks and average of best two IA will be considered for CIE marks and other methods of assessment as per VTU regulation 220B2.4.

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Semester-End Examination:

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1.	Construction and working principle of DC motors.	20%
	2.	Back E.M.F and its significance.	
	3.	Torque equation, Classification.	
	4.	Characteristics of shunt, series & compound motors.	
	5.	Speed control of shunt motor, Application of motors.	
	6.	Losses in DC motors.	
	7.	Power flow diagram, efficiency, condition for maximum efficiency.	
	8.	Direct & indirect methods of testing of DC motors.	
	9.	Swinburne's test.	
	10.	Field's test, merits and demerits of tests.	
2	11.	Concept and generation of rotating magnetic field.	20%
	12.	Principle of operation.	
	13.	Construction of I.M.	
	14.	Classification and types of squirrel-cage and slip-ring I.M.	
	15.	Slip and its significance.	
	16.	Torque equation.	
	17.	Torque-slip characteristic covering motoring, generating and braking regions of operation.	
	18.	Maximum torque.	
3	19.	Phasor diagram of induction motor on no-load and on load.	20%
	20.	Equivalent circuit, losses, efficiency.	
	21.	No-load and blocked rotor tests.	
	22.	Performance of the motor from the equivalent circuit.	
	23.	Cogging and crawling.	
	24.	High torque rotors-double cage and deep rotor bars.	
	25.	Induction motor working as induction generator.	
	26.	Construction and working of doubly fed induction generator.	
4	27.	Need for starter.	20%
	28.	Direct on line, Star-Delta starter.	
	29.	Autotransformer starting and Rotor resistance starting	
	30.	Speed control by frequency.	
	31.	Double revolving field theory and principle of operation.	
	32.	Construction and operation of split-phase motors.	
	33.	Construction and operation of capacitor start, capacitor run motors.	
	34.	Shaded pole motors, Comparison of single phase motors and applications.	
5	35.	Principle of operation, phasor diagrams.	20%
	36.	Torque and torque angle.	
	37.	Effect of change in load, effect of change in excitation.	
	38.	V and inverted V curves.	
	39.	Synchronous condenser.	
	40.	Construction and operation of Universal motor, AC servomotor.	
	41.	Construction and operation of Linear induction motor.	
	42.	Construction and operation of PMSM, SRM motors	
	43.	Construction and operation of BLDC motors.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: As per University Question paper pattern to attain COs and POs.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1, 2 & 3 of the syllabus	9	Individual Submission in the standard format is expected	Book 1, 2 of the textbooks list.
2	Assignment 2: On line quiz covering all modules to attain COs and POs	Students study all Topics and appear for on line quiz to enhance subject knowledge.	Module 1-5 of the syllabus	12	Individual Submission through on line Google link.	Book 1,2 and 3 of the textbooks list.

14.0 QUESTION BANK

Module 1

1. A series motor should never be started on no-load" justify the above statement with proper reasoning.
2. Explain the method of speed control of DC shunt machine by ward Leonard method.
3. Derive the standard torque equation for DC Motor.
4. A dc motor takes an armature current of 110A at 480V. The armature circuit resistance is 0.2 ohm. The machine has 6 poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05wb. Calculate (a) speed and (b) gross torque developed by the motor.
5. What is back? Explain the significance of back emf.
6. Explain the working and performance, characteristic, advantage, disadvantage and application DC motor.
7. Discuss the characteristic of DC shunt, series and compound motor.
8. Discuss the speed control methods of dc shunt motor.
9. Draw the power flow diagram of a DC motor and derive the condition for maximum efficiency.
10. Explain with circuit diagrams, the armature control methods of DC shunt motors.
11. Explain the Swinburne's test to predetermine the efficiency of d.c machine by computing mechanical losses and discuss merit and demerit of it.
12. Briefly describe the field test applied to two similar dc series motor.
13. Mention the various methods of testing a DC machine and discuss on the limitations of each method.

Module 2

1. With 3- ø flux wave diagram & vector diagram explain how you obtain rotating magnetic field in a 3- ø IM & also explain the production of torque.
2. What are different types of induction motors? Explain their uses.
3. Derive the equation for torque developed by an IM taking stator impedance into account. Draw a typical torque slip curve & deduce the condition for max torque.
4. Draw & explain the phasor diagram & equivalent circuit of a 3 ø IM.
5. Draw the complete torque slip characteristics of a 3- ø IM indicating all the regions & explain
6. Explain the torque-slip characteristics of 3- ø IM under the condition of variable frequency, constant V/F ratio.
7. The no load test on 60HP, 220V DC shunt motor gave the following results on no load test. Input current =13.25 amps, Field current=2.55 amps, Resistance of armature=0.032 ohm, Brush drop =2 Volts. Find the full load current and full load efficiency.
8. A 6 pole, 3 phase induction motor develops a maximum torque of 30 Nm at 960 rpm. Determine the torque exerted by motor at 5 % slip. The rotor resistance per phase is 0.6 ohm.

Module 3

1. Explain the phenomenon of cogging and crawling in a 3ph Induction Motor.
2. Discuss the working of deep bar and double cage Induction Motor.
3. With neat circuit diagram, explain no load and blocked rotor test conducted on 3ph Induction Motor to construct circle diagram.
4. Develop the approximate equivalent circuit of Induction Motor.
5. Derive condition for maximum power output of Induction Motor.
6. Discuss the no load and blocked rotor test of Induction Motor.
7. A 440V, 3ph, 8pole, 40kW, star connected three phase Induction Motor has the following parameters: Stator resistance (R_1)=0.1 ohm, stator reactance X_1=0.4 ohm, Equivalent rotor resistance referred to stator R_2=0.15 ohm, equivalent rotor reactance referred to stator X_2=0.44 ohm. The stator core loss is 1250 Watt while the mechanical loss is 1000W. It draws a no load current of 20A at a power factor of 0.9 lagging while running at speed of 727.5rpm. Calculate i) input line current and power factor ii) Torque developed iii) Output power. Use approximate equivalent circuit.
8. The cages of double cage Induction Motor have a standstill impedance of (3.5+1.5j) ohm and (0.6+7j) ohm. Full load slip is 6%. Find the starting torque in terms of full load torque. Neglect stator impedance and magnetizing current.
9. Explain the working of induction motor as Induction generator.
10. Explain the construction and working of doubly fed induction generator.

Module 4

1. Why starter is necessary to start IM? Explain in detail, direct online (D.O.L) starter.
2. Explain in detail auto transformer method of starting a cage Induction Motor.
3. Explain frequency control method for speed control of 3ph Induction Machine
4. With neat sketch explain the construction, working principle and application of split phase single phase Induction Motor
5. With neat sketch explain the construction, working principle of capacitor start and capacitor run 1-ph Induction Motor
6. With neat sketch explain the construction, working principle of shaded pole 1-ph Induction Motor
7. Why starter is necessary to start IM? Explain in detail rotor resistance starting of slip ring Induction Motor.
8. A 18650W, 4pole, 50Hz, 3-ph Induction Motor has friction and windage losses of 2.5% of the output. The FL slip is 4%. Compute for FL i)rotor copper loss ii)rotor input iii)the shaft torque
9. Explain double revolving field theory of 1-ph Induction Motor and prove that starting torque is zero.

Module 5

1. With phasor diagram, describe working principle of synchronous motor.
2. Discuss, why synchronous motor is not self starting?
3. Write a note on V and inverted V curves of synchronous motor.
4. Discuss the effect of change in load and excitation on performance of synchronous motor.
5. Explain the phenomenon of hunting in synchronous machine and method of reducing the same.
6. Explain how two or more alternators are made to share the load in propagation to their rating.
7. An alternator is supplying constant load. With suitable vector diagram and explain the effect of variation on excitation on armature current and load power factor.
8. Write a short note on synchronous condenser.
9. Explain the construction and operation of Universal and linear induction motor.
10. Explain the construction and operation of AC servo motor
11. Explain the construction and operation of PMSM, SRM and BLDC motors.

Prepared by	Checked by		
18/4/24		23/4	
Prof. S.D.Hirekodi	**Prof. Amit Neshti**	**HOD**	**Principal**

Subject Title	**TRANSMISSION AND DISTRIBUTION**		
Subject Code	BEE402	**IA Marks**	50
Number of Lecture Hrs /	4:0:0	**Exam Marks**	50
Total Number of Lecture Hrs	50	**Exam Hours**	03
Credits 04			

FACULTY DETAILS:		
Name: Dr. B. V. Madiggond	**Designation:** Professor & HOD	**Experience:** 30Years
No. of times course taught: Many times	**Specialization:** Power Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical and Electronics Engineering	III	EPG
02	First Year	I/II	BEE

2.0 Course Objectives

(1) To understand the concepts of various methods of generation of power.
(2) To understand the importance of HVAC, EHVAC, UHVAC and HVDC transmission.
(3) To design insulators for a given voltage level.
(4) To calculate the parameters of the transmission line for different configurations and assess the performance of the line.
(5) To study underground cables for power transmission and evaluate different types of distribution systems.

3.0 Course Outcomes

At the end of the course, the student will be able to,

COs	Course Outcome	Cognitive Level	POs
C219.1	Explain the structure of electrical power system, its components, advantages of high voltage AC and DC transmission, various conductors used for transmission, sag and its calculation.	L1,L2	1,2,3,4,6,7,12
C219.2	Explain various types of insulators and methods to improve string efficiency.	L1,L2,L3	1,2,3,4,7,812
C219.3	Explain the various transmission line parameters, their effects on transmission of electricity.	L1,L2,L3,L4	1,2,3,4,6,812
C219.4	Evaluate the parameters that influence the performance of transmission line and to calculate performance parameters of various transmission lines	L1,L2,L3,L4	1,2,3,4,6,7,8,9, 10,11,12
C219.5	Explain carona and its effects, underground cable and its construction, classification, limitations and specifications.	L1,L2,L3,L4	1,2,3,4,6,12
C219.6	Evaluate different types of distribution systems.	L1,L2,L3,L4	1,2,3,4,6,12
Total Hours		**50**	

4.0 Course Content

Module-1

Introduction to Power System: Structure of electric power system: generation, transmission and distribution. Advantages of higher voltage transmission: HVAC, EHVAC, UHVAC and HVDC. Interconnection. Feeders, distributors and service mains**.** **Overhead Transmission Lines:** A brief introduction to types of supporting structures and line conductors Conventional conductors; Aluminium Conductor steel reinforced (ACSR), All – aluminium alloy conductor (AAAC) and All –aluminium conductor (AAC). High temperature conductors**;** Thermal resistant aluminium alloy (ATI),Super thermal resistant aluminium alloy (ZTAI), Gap type thermal resistant aluminium alloy conductor steel reinforced (GTACSR), Gap type super thermal resistant aluminium alloy conductor steel reinforced (GZTACSR). Bundle conductor and its advantages. Importance of sag, Sag calculation – supports at same and different levels, effect of wind and ice. Line vibration and vibration dampers. Overhead line protection against lightening; ground wires.

Overhead Line Insulators: A brief introduction to types of insulators, material used- porcelain, toughened glass and polymer (composite). Potential distribution over a string of suspension insulators. String efficiency, Methods of increasing string efficiency. Arcing horns. **10 Hours**

Revised Bloom's Taxonomy Level L1 – Remembering, L2 – Understanding.

Module-2

Line Parameters: Introduction to line parameters- resistance, inductance and capacitance. Calculation of inductance of single phase and three phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Inductance of composite – conductors, geometric mean radius (GMR) and geometric mean distance (GMD). Calculation of capacitance of single phase and three phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Capacitance of composite – conductor, geometric mean radius (GMR) and geometric mean distance (GMD). Advantages of single circuit and double circuit lines. **10 Hours**.

Revised Bloom's Taxonomy Level L1 – Remembering, L2 – Understanding. L3 – Applying.

Module-3

Performance of Transmission Lines: Classification of lines – short, medium and long. Current and voltage relations, line regulation and Ferranti effect in short length lines, medium length lines considering Nominal T and nominal circuits, and long lines considering hyperbolic form equations. Equivalent circuit of a long line. ABCD constants in all cases. **10 Hours**.

Revised Bloom's Taxonomy Level L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analysing.

Module-4

Corona: Phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona.

Underground Cable: Types of cables, constructional features, insulation resistance, thermal rating, charging current, grading of cables – capacitance and inter-sheath. Dielectric loss. Comparison between ac and DC cables. Limitations of cables. Specification of power cables. **10 Hours**

Revised Bloom's Taxonomy Level L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analysing.

Module-5

Distribution: Primary AC distribution systems – Radial feeders, parallel feeders, loop feeders and interconnected network system. Secondary AC distribution systems – Three phase 4 wire system and single phase 2 wire distribution, AC distributors with concentrated loads. Effect of disconnection of neutral in a 3 phase four wire system.

Reliability and Quality of Distribution System: Introduction, definition of reliability, failure, probability concepts, limitation of distribution systems, power quality, Reliability aids. **10 Hours**

Revised Bloom's Taxonomy Level L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VI	Power system analysis and stability	All
01	VII	Computer techniques in power system analysis	All
02	VII	Electric Design Estimating & Costing	6 and 7

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Design and erection of transmission lines and electric power transmission and distribution
02	Describe Substation and Fault analysis of power system by software tools.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Practical	Modeling of Power System, Obtaining ABCD parameters of TL's using MATLABprogram. Industrial Visits

8.0 Books Used and Recommended to Students

Text Books
1. A Course in Electrical Power Soni Gupta and Bhatnagar Dhanpat Rai 2. Power System Analysis and Design J. Duncan Glover at el Cengage Learning 4th Edition 2008 3. Principles of Power System V.K. Mehta Rohit Mehta S. Chand Publishers 1st Edition 2013 4. Electrical power Generation, Transmission and Distribution S.N. Singh PHI 2nd Edition,2009 5. Electrical Power S.L.Uppal Khanna Publication
Reference Books
1. Electrical power systems C. L. Wadhwa New Age International 5th Edition, 2009 2. Electrical power systems Ashfaq Hussain CBS Publication 3. Electric Power Distribution A.S. Pabla Mc Graw-Hill 6th Edition,2011
Additional Study material & e-Books

1. For High temperature conductors refer www.jpowers.co.jp/english/product/pdf/gap_c1.pdf and Power System Analysis and Design, J. Duncan Glover at el
2. http://ebookkdownload.blogspot.in/search/label/Electrical%20Engineering

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. https://energy.gov/oe/downloads/electricity-transmission-primer
2. https://energy.gov/oe/downloads/draft-chapter-4-transmission-adequacy
3. https://www.youtube.com/watch?v=Yg6XsepGCKY&list=PLD4ED2FAF3C155625
4. https://www.youtube.com/watch?v=lr1jgbR5ca8&index=10&list=PLD4ED2FAF3C155625
5. https://www.youtube.com/watch?v=y_UJvHMEun0&index=11&list=PLD4ED2FAF3C155625
6. https://www.youtube.com/watch?v=OsgIo5z-0EA&index=12&list=PLD4ED2FAF3C155625

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Transactions on power system	http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=59
2	IEEE power engineering review	http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=39
3	IEEE transactions on power delivery	http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=61
4	Power and Energy technology systems journal	http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6687318

11.0 Examination Note

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.

The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered.

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned.

The teacher should not conduct two assignments at the end of the semester if two assignments are planned. For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course **(duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion
1	1.	**Introduction to power system:** Structure of electric power system: Generation, Transmission and distribution.	20
	2.	Advantages of high voltage transmission: HVAC, EHVAC, UHVAC and HVDC. Interconnection. Feeders, Distributors and service mains.	
	3.	**Overhead transmission lines:** A brief introduction to types of supporting structures and line conductors-Conventional conductors; Aluminium Conductor steel reinforced (ACSR),	
	4.	All –aluminium alloy conductor (AAAC) and All –aluminium conductor (AAC). High temperature conductors; Thermal resistant aluminium alloy (ATI),Super thermal resistant aluminium alloy (ZTAI),	
	5.	Gap type thermal resistant aluminium alloy conductor steel reinforced (GTACSR), Gaptype super thermal resistant aluminium alloy conductor steel reinforced (GZTACSR). Bundle conductor and its advantages.	
	6.	Importance of sag, Sag calculation – supports at same and different levels, Effect of wind and ice. Line vibration and vibration dampers. Overhead line protection against lightening; ground wires.	
	7.	**Overhead line Insulators:** A brief introduction to types of insulators, Material used - porcelain, toughened glass and polymer (composite).	
	8.	Potential distribution over a string of suspension insulators. String efficiency, Methods of increasing string efficiency. Arcing horns.	
	9.	Numerical	
	10.	Numerical	
2	11.	**Line parameters:** Introduction to line parameters- Resistance, Inductance and capacitance.	20
	12.	Calculation of inductance of single phase with equilateral spacing, Unsymmetrical spacing, Double circuit and transposed lines.	
	13.	Calculation of inductance of Three phase with equilateral spacing, Unsymmetrical spacing, Double circuit and transposed lines.	
	14.	Inductance of composite – conductors, Geometric mean radius (GMR) and geometric mean distance (GMD).	
	15.	Calculation of capacitance of single phase and three phase lines with equilateral spacing,	
	16.	Unsymmetrical spacing, Double circuit and transposed lines.	
	17.	Capacitance of composite – conductor, Geometric mean radius (GMR) and geometric mean distance (GMD).	
	18.	Advantages of single circuit and double circuit lines.	
	19.	Numerical	
	20.	Numerical	
3	21.	**Performance of transmission lines:** Classification of lines – Short, Medium and Long lines.	20
	22.	Current and voltage relations,	
	23.	Line regulation and Ferranti effect in short length lines,	
	24.	Medium length lines considering Nominal T circuits,	
	25.	Medium length lines considering Nominal π circuits,	
	26.	Long lines considering hyperbolic form equations.	
	27.	Equivalent circuit of a long line.	
	28.	ABCD constants in all cases	
	29.	Numerical	
	30.	Numerical	
4	31.	**Corona:** Phenomena, Disruptive and visual critical voltages,	20
	32.	Corona loss. Advantages and disadvantages of corona. Methods of reducing corona.	
	33.	**Underground cable:** Types of cables, Constructional features,	
	34.	Insulation resistance, Thermal rating, Charging current,	
	35.	Grading of cables – capacitance	
	36.	Grading of cables – inter sheath	
	37.	Dielectric loss. Comparison between ac and dc cables.	
	38.	Limitations of cables. Specification of power cables.	
	39.	Numerical	
	40.	Numerical	

5	41.	**Distribution:** Primary AC distribution systems – Radial feeders, parallel feeders, loop feeders and interconnected network system.	**20**
	42.	Secondary AC distribution systems – Three phase 4 wire system and single phase 2 wire distribution,	
	43.	AC distributors with concentrated and uniform loads.	
	44.	Effect of disconnection of neutral in a 3 phase four wire system.	
	45.	**Reliability and Quality of Distribution system:** Introduction, Definition of reliability, failure,	
	46.	Probability concepts, Limitation of distribution systems, Power quality, Reliability aids.	
	47.	Numerical	
	48.	Numerical	
	49.	Numerical	
	50.	Numerical	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
2	Assignment 1: University Questions on Line parameters	Students understand line parameters get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Written solution expected.	Book 3,4 of the text book list. & reference 1,2
4	Assignment 2: University Questions on Corona & UG cables	Students know Corona & UG cables & get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Written solution expected.	Book 3,4 of the text book list. & reference 1,2

14.0 QUESTION BANK

Module 1

Q1.Name types of line vibratins and explain Aeoline vibrations.
Q2.Explain with the help of neat line diagram a typical transmission and distribution system scheme indicating standard voltages.
Q3.What are the advantages of High voltage transmission? Explain.
Q4.Write a short note on HVDC transmission, feeder, distributors and service mains with a neat sketch.
Q5.Explain sag and what are the factors affecting sag? Derive the expression for sag when the supports are at unequal heights.
Q6.A transmission line conductor at a river crossing is supported form two towers of heights 50mts and 80mts above water level. The horizontal distance between the towers is 500mts. If the tension in the conductor is 3000kgs. Find the minimum clearance between the conductor and water. Weight of the conductor per meter is 0.844kg.
Q7.Explain the pin type insulator with a neat diagram.
Q8.Define string efficiency. Explain the methods of improving string efficiency.
Q9.A 33kv overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of the self capacitance of each insulator, find, the distribution of voltage over three insulators and string efficiency.
Q10.An OH TL at a river crossing is supported from two towers at heights of 40m and 90m above water level, the horizontal distance between the towers being 400m. if the maximum allowable tension is 2000kg. Find the clearance between the conductor and water at appoint midway between the towers. Weight of conductor is 1kg/m.
Q11.Explain stringing charts.
Q12.Write a note on effect of high voltage on TL.
Q13.Compare AC and distribution systems with respect to bulk power generation, transmission voltage levels, line charging current and power conversion.
Q14.Show that increase in transmission voltage causes reduction in copper losses and reduced weight of conductor material.
Q15.Discuss the necessity of sag and tension calculation in erection of OH lines.
Q16. Obtain an expression for sag of a line conductor suspended between two equal supports. Assume parabolic configuration.
Q17. Explain the different methods to equalize the potential across a string of suspension insulators.
Q18. An insulator for 66kV is provided with 5 discs. The capacitance between the each joint and tower is $1/6^{th}$ of the self capacitance of each disc. Find the voltage across each disc and also string efficiency.
Q19. A transmission line has a span of 275m with diameter 19.5mm and weight 0.844 kg/m has a ultimate breaking strength of 7950kg. Each conductor has a radial covering of ice 9.53mm thick and is subjected to a horizontal wind

pressure of 40kg/m^2 of the ice covered projected area. If the factor of safety(FOS) is 2, calculate the deflected sag and vertical component of the sag. Given one cubic meter of ice weighs 913.5kg.
Q20. What are the limitations of increasing the transmission voltage level to high volume?
Q21. State the effect of high voltage used in transmission on volume of copper required, line efficiency and line voltage drop.
Q22. Explain the following components of distribution i) substation ii) distribution substation iii) feeder iv) service mains v) distributors.
Q23. The two towers of height 95m and 70m respectively support the line conductor at a river crossing. The horizontal distance between the towers is 400m. If the tension in the conductor is 1100kg and its weight is 0.8kg/m, calculate i)sag at lower support ii)sag at upper support iii)clearance of lowest point on trajectory from water level. Assume bases of towers to be at the same level.
Q24. Explain different types of insulators. Explain any one of them with neat figure.
Q25. Each line of a three phase system is suspended by a string of three similar insulators. If the voltage across the line is 20kV, calculate the line to neutral voltage and the string efficiency. Assume that the shunt capacitance between each insulator and earthed metal work of tower to be 1/10th the capacitance of the insulator.
Q26. Mention the different methods of increasing string efficiency. Explain any one method in brief.
Q27. Write a short note on testing of insulators briefly explain different tests.
Q28. Derive the relevant equations for demonstrating the effect of the ice deposition and wind loading on sagging of a transmission line.
Q29 Write a short note on vibration of conductors.
Q30 Derive an expression for the string efficiency for 4 disc string.
Q31 With a neat diagram, explain feeders, distributors and service mains of a distribution system.

Module 2

Q1.Find the inductance/ph/km of double circuit three phase line shown in fig. The line is completely transposed. Use GM method. The radius of the conductor is 9mm.
Q2.Write on transposition of transmission lines.
Q3. Derive an expression for inductance per phase for a 3phase OH TL when conductors are asymmetrically placed but theline is completely transposed.
Q4. Calculate the loop inductance per km of a single phase TL consisting of two parallel conductors 1.5m apart and 1.5cmin diameter. Calculate also the reactance of the transmission line if it is operating at a frequency of 50Hz.
Q5. A three phase transmission line 100km ling has its conductors of 0.6cm diameter spaced at the corners of an equilateral d triangle of 100cm side. The arrangement is shown in fig. find the inductance per phase of the system.
Q6. Derive an expression for capacitance of a three phase line with equilateral spacing.
Q7. Derive an expression for inductance due to internal flux linkage, inductance due to external flux linkage, inductance ofa 1-phase two wire line.
Q8. Determine the loop inductance and reactance per km of a single phase 50Hz transmission line consisting of two parallel conductors spaced 1m apart and 1.25cm diameter.
Q9. Obtain an expression for capacitance of a three phase symmetrically spaced
TL.Q10. Describe composite conductors and discuss their advantages.
Q11.Derive the expression for capacitance of a transposed three phase line with unsymmetrical spacing.
Q12. A single phase OH line 30km long consists of 2 parallel wires each 5mm in diameter and 1.5m apart. If the line voltage is 50kV at 50Hz, calculate charging current with line open-circuited.
Q13. Obtain self GMD and mutual GMD and hence calculate inductance/km of each conductor in a three phase three wire system. Conductors are arranged at the vertices of a triangle of sides 2.5m, 3m and 5m. These are transposed at regular intervals. Diameter of each conductor is 1.5cm.
Q14. Explain the terms self GMD and mutual GMD
Q15. The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2m, 2.5m and 4.5m.calculatethe inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24cm. Q16. Derive an expression for the inductance of a single phase two wire line.
Q17. A three phase, 50Hz, 132kV OH line has conductor placed in a horizontal plane 4 meter apart. Conductor diameter is 2cm. If the line length is 100km. Calculate the charging current per phase. Assume complete transposition.
Q18. Derive an expression for the capacitance of a three phase oh line for symmetrical spacing and unsymmetrical spacing.

Module 3

Q1.Derive an expression for ABCD constants of a long transmission line using Rigorous method of analysis.
A three phase line delivers 5000kW at 22kV and at a p.f of 0.8 lagging to a load. Determine sending end voltage, percentage regulation and transmission efficiency. The resistance and reactance of each conductor is 4 ohm and 6 ohm respectively.
Q2.A three phase, 50Hz, 16km long OH line supplies 1000kW at 11kV, 0.8p.f lagging. The resistance is 0.03 ohm per phase per km and inductance is 0.7mH per phase per km. calculate the sending end voltage, percentage voltage regulation and efficiency of transmission.
Q3 Write on ABCD constants of TL.

Q4. Write a short notes on bundled conductors and skin effect.
Q5. Deduce an expression for transmission efficiency and regulation for medium transmission line using nominal T method.
Q6 A 110kV, 50Hz, three phase TL delivers a load of 40MW at 0.85 lagging p.f at the receiving end. The generalized constants of the TL are. A=D=0.95 angle 1.4 degree, B=96 angle 78 degree ohm, C=0.0015 angle 90 degree mho. Find the regulation of the line and charging current use nominal T-method.
Q7. Explain Ferranti effect in long transmission lines, with the help of a phasor diagram.
Q8. Obtain expression for sending end voltage and current in terms of ABCD constants and receiving end voltage and current for a nominal Pi model of a transmission line. Also draw the phasor diagram.
Q9. A three phase, 50Hz OH TL has the following distributed constants: R=28 ohm, X_L=63ohm, T =4*10^{-4} mho.
Q10. A three phase short TL delivers 3MW at a p.f of 0.8 lagging to a load. If the sending end voltage is 33kV, determine i)Receiving end voltage ii)Line current iii)Transmission efficiency iv)Regulation. The resistance and reactance of each conductor are 5 ohm and 8 ohm respectively.
Q11. Discuss the nominal T method of a medium TL with appropriate circuit diagram and phasor diagram and hence obtain the expressions for regulation and ABCD constants for the same.
Q12. Two transmission lines having generalized circuit constants A1,B1,C1,D1 and A2,B2,C2,D2 are connected in series. Develop expressions for the overall constants ABCD of the combination in terms of A1,B1,C1,D1 and A2,B2,C2,D2.

Module 4

Q1.Write the factors affecting corona. Derive the expressions for critical disruptive voltage and visual critical voltage and power loss in corona.
Q2.State the advantages of using UG cables for power distribution.
Q3.What is meant by grading of cable? Explain capacitance grading.
Q4.A single core lead sheathed cable has a conductor diameter of 3cm, the diameter of the cable being 5cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30kV/cm and 20kV/cm. calculate the radial thickness of each insulation and the safe working voltage of the cable.
Q5.Write a note on insulating materials for cables.
Q6. Explain the phenomenon of corona in OH
TL's.
Q7. Show that in a single core cable the ratio of maximum to minimum stress g_{max}/g_{min}=R/gamma, where R=sheath radius, gamma=core radius.
Q8. A 33kV, three phase UG cable, 4km long, uses three single cables. Each of the conductor has a diameter of 2.5cm and the radial thickness of insulation 0.5cm. the relative permittivity of the dielectric is 3. Find capacitance of the cable/phase, charging current/phase, total charging kVAR.
Q9. For the most economical diameter of a single core cable to be used on 66kV, three phase system. If the peak permissible stress is not to exeed 50kV/cm. also find the overall diameter.
Q10. Determine the critical disruptive voltage and the critical visual voltage for a three phase, 50Hz, 132kV line situates ina temperature of 30 degree Celsius and at a barometric pressure of 74cm. the conductor diameter is 1.5cm while the equilateral spacing between the conductors is 2.75m. the surface irregularity factor is 0.9 while m=0.75.
Q11. Discuss the factors affecting corona power
loss.Q12. Briefly explain Laying of UG cable.
Q13. Explain the methods of reducing corona
effect.Q14. What are the merits and demerits of
corona?
Q15. Derive an expression for potential gradient.
Q16. A single core cable has a conductor diameter of 1cm and insulation thickness of 0.4cm. If the specific resistance ofthe insulation is 5*10^14 ohm cm. Calculate the insulation resistance of a 2km length of the cable.

Module 5

Q1. Mention the different schemes of distribution system and explain radial distribution system.
Q2. Explain the requirements of a distribution system.
Q3. Explain radial and ring main distribution system. What are the advantages and disadvantages of radial distribution?
Q4. Write a note on feeders, distributors and service mains.
Q5. A single phase, distribution 2km long supplies a load of 120A at 0.8p.f lag at its far end and a load of 80A at 0.9 pf lagat its midpoint. Both the power factors are referred to the voltage at far end. The resistance and reactance per km(go and return) are 0.05ohm and 0.1ohm respectively. If the voltage at the far end is maintained at 230V and calculate voltage at the sending end, phase angle between voltages at the two ends.
Q6. A two wire distributor 1200m long is loaded as shown in fig. B is the mid point. The power factors at the two load points refer to the voltage at C. The impedance of each line is 0.15+0.2j ohm. Calculate the sending end voltage and voltage, current and power factor. The voltage at point C is 220V
Q7. Explain radial feeders for AC distribution system. Mention the characteristics of radial feeders.
Q8. A 3phase,4-Wire system supplies power at 440V and lighting at 230V. If the lamps in use requires70, 84 and 33 A in each of the three lines. What should be the current in the neutral wire? If a 3-phase motor is now taking 200A from

thelines at a pf of 0.2 lagging. What should be the total current in each line and the neutral wire? Find the total power suppliedto the lamps and the motor.
Q9. Explain 3-phase four wire star connected unbalanced loads for AC distribution system.
Q10 A single phase AC distributor AB 300 meter long is fed from end A and is loaded as under, i)100A at 0.707pf lagging 200m from point A. ii)200A at 0.8pf lagging 300m from point A.
The load resistance and reactance of the distributor is 0.2 ohm and 0.1 ohm per kilometers. Calculate the total voltage drop in the distributor. The power factors refer to the voltage at the far end.

Prepared by	Checked by		
			
Dr. B. V. Madiggond	**Prof. H. R. Zinage**	**HOD**	**Principal**

Subject Title	**Microcontroller**		
Subject Code	BEE403	**CIE Marks**	50
Number of Lecture Hrs / Week (L:T:P:S)	3:0:2:0	**SEE Marks**	50
Total Number of Lecture Hrs	40 hours Theory + 10 Lab Slots	**Exam Hours**	03
		CREDITS – 04	

FACULTY DETAILS:		
Name: Shri: Mahesh Yenagimath	**Designation:** Asst. Professor	**Experience:**18
No. of times course taught: 01	**Specialization:** VLSI and Embedded System	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical and Electronics Engineering	III	Digital System Design

2.0 Course Objectives

1. To explain the internal organization and working of Computers, microcontrollers and embedded Processors.
2. Compare and contrast the various members of the 8051 family.
3. To explain the registers of the 8051 microcontroller, manipulation of data using registers and MOV instructions.
4. To explain in detail the execution of 8051 Assembly language instructions and data types.
5. To explain loop, conditional and unconditional jump and call, handling and manipulation of I/O instructions.
6. To explain different addressing modes of 8051, arithmetic, logic instructions, and programs.
7. To explain develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic.
8. To explain writing assembly language programs for data transfer, arithmetic, Boolean and logical instructions.
9. To explain writing assembly language programs for code conversions.
10. To explain writing assembly language programs using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers.
11. To perform interfacing of stepper motor and DC motor for controlling the speed.
12. To explain generation of different waveforms using DAC interface.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	Cognitive Level	POs
C220.1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.	L_1,L_2,L_3,L_4	PO1, PO2, PO8, PO10, PO12
C220.2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.	L_1,L_2,L_3,L_4	PO1, PO2, PO3, PO8, PO10, PO12
C220.3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmeticoperations, data conversion and timer/counter programming.	L_1,L_2,L_3,L_4	PO1, PO2, PO3, PO8, PO10, PO12
C220.4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial datacommunication and interrupt programming.	L_1,L_2,L_3,L_4	PO1, PO2, PO3, PO8, PO10, PO12
C220.5	Program 8051 to work with external devices for ADC, DAC, Stepper motor control, DC motor control.	L_1,L_2,L_3,L_4	PO1, PO2, PO3, PO8, PO10, PO12
Total Hours of instruction		**40**	

4.0 Course Content

MODULE – 1
8051 Microcontroller Basics: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM.8051 Addressing Modes.

MODULE – 2
Assembly Programming and Instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

MODULE - 3
8051 Programming in C: Data types and time delay in 8051C, IO programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, Accessing code ROM space in 8051C, Data serialization using 8051C.
8051 Timer Programming in Assembly and C: Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C.

MODULE – 4
8051 Serial Port Programming in Assembly and C: Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in assembly, serial port programming in 8051 C.
8051 Interrupt Programming in Assembly and C: 8051 interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C.

MODULE – 5
Interfacing: LCD interfacing, Keyboard interfacing. ADC, DAC and Sensor Interfacing: ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.
Motor Control: Relay, PWM, DC and Stepper Motor: Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM.
8051 Interfacing with 8255: Programming the 8255, 8255 interfacing, C programming for 8255.

Sl. NO	Experiments
1	Arithmetic instructions: Addition, subtraction, multiplication and division. Square using MATLAB/simulink.
2	Data transfer – Program for block data movement, sorting, exchanging, finding largest element in an array.
3	Up/Down BCD/Binary Counters
4	Boolean and logical instructions (bit manipulation).
5	Code conversion programs – BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexa.
6	Programs to generate delay, Programs using serial port and on-chip timer/counters.
Note: Single chip solution for interfacing 8051 is to be with C Programs for the following experiments.	
7	Simulate and test a PWM controlled DC motor using Simscape.
8	Stepper motor interface for direction and speed control.
9	Alphanumerical LCD panel interface
10	Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Automation

6.0 Relevance to Real World

SL.No	Real World Mapping
01	8051 chips are used in a wide variety of control systems, telecom applications
02	Robotics as well as in the automotive industry.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Additional programs related real world interfacing.

8.0 Books Used and Recommended to Students

Text Books: Suggested Learning Resources
(1) The 8051 Microcontroller and Embedded Systems Using Assembly and C, Muhammad Ali Mazadi, Pearson, 2nd Edition, 2008.
(2) The 8051 Microcontroller, Kenneth Ayala, Cengage, 3rd Edition, 2005.
(3) Microcontrollers: Architecture, Programming, Interfacing and System Design, Raj Kamal, Pearson, 1st Edition, 2012.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1) http://www.circuitstoday.com/8051-microcontroller
2) http://learn.mikroe.com/ebooks/8051programming/chapter/what-is-8051-standard/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	International journal of innovative research in technology	www.ijirt.org/master/publishedpaper/IJIRT.
2	Science Direct	www.sciencedirect.com/science/book

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for Internal Assessment Tests (Three Tests, each of 25 Marks with 01-hour duration, are to be conducted and average of best two test marks is taken and scaled down to 15 marks) and 10 marks for other assessment methods like assignment (05 marks) and quiz (05 marks).
- Scaled-down marks of the average of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).

- The student has to secure 40% of 15 marks i.e. 06 marks in CIE- IA tests and 40% of 10 marks i.e. 04 marks in CIE- CCAs (other assessment methods) to qualify in the CIE of the theory component of IPCC.
- The minimum marks to be secured in CIE theory component to appear for SEE shall be 10 (i.e. 40% of maximum marks-25).
- The theory portion of the IPCC shall be for both CIE and SEE.

CIE for the practical component of the IPCC

- CIE marks for the practical component is 25 marks.
- 15 marks for the conduction of the experiment and preparation of laboratory record, and 10 marks for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 02/03 hours) after completion of all the experiments shall be conducted for 50 marks and scaled down to 10 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 15 marks i.e. 06 marks in CIE- practical and 40% of 10 marks i.e. 04 marks in CIE practical test to qualify in the CIE of the practical component of IPCC.
- The minimum marks to be secured in CIE practical component is 10 (i.e. 40% of maximum marks-25)
- Practical portion will have a CIE component only.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Questions mentioned in the SEE paper may include questions from the practical component.
- SEE exam is a theory exam, conducted for 100 marks, scored marked by the student shall be scaled down to 50 Marks.
- Students have to score minimum 18 marks out of 50 to qualify in SEE.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Inside the Computer	20
	2	Microcontrollers and Embedded Processors	
	3	Block Diagram of 8051	
	4	PSW and Flag Bits	
	5	8051 Register Banks and Stack	
	6	Internal Memory Organization of 8051	
	7	IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051	
	8	Pins Of 8051. Memory Address Decoding	
	9	8031/51 Interfacing With External ROM And RAM	
	10	8051 Addressing Modes	
2	11	Introduction to 8051 assembly programming	20
	12	Assembling and running an 8051 program	
	13	Data types and Assembler directives	
	14	Arithmetic instructions	
	15	Logic and Jump instructions	
	16	loop and call instructions	
	17	Programs	

	18	Programs	
	19	Programs	
	20	IO port programming.	
3	21	Data types	20
	22	time delay in 8051C	
	23	IO programming in 8051C	
	24	Logic operations in 8051 C	
	25	Data conversion program in 8051 C	
	26	Accessing code ROM space in 8051C	
	27	Data serialization using 8051C	
	28	Programming 8051 timers	
	29	Counter programming	
	30	Programming timers 0 and 1 in 8051 C	
4	31	Basics of serial communication	20
	32	8051 connection to RS232,	
	33	8051 serial port programming in assembly,	
	34	serial port programming in 8051 C.	
	35	8051 interrupts	
	36	Programming timer	
	37	External hardware	
	38	Serial communication interrupt	
	39	Interrupt priority in 8051/52	
	40	Interrupt programming in C	
5	41	LCD interfacing	20
	42	Keyboard interfacing	
	43	ADC 0808 interfacing to 8051	
	44	Serial ADC Max1112 ADC interfacing to 8051	
	45	DAC interfacing, Sensor interfacing and signal conditioning	
	46	Relays and opt isolators	
	47	stepper motor interfacing	
	48	DC motor interfacing and PWM	
	49	Programming the 8255, 8255 interfacing	
	50	C programming for 8255	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on 8051 Microcontroller Basics	Students study the importance of accessing data and I/O port programming, arithmetic, logic instructions, and programs.	Module 2	8	Individual Activity.	Text book no.1
2	On line Quiz	Students study the topics of all five modules.	All Modules of the syllabus.	12	Individual Activity.	Text book no.1

14.0 QUESTION BANK

Module 1: 8051 Microcontroller Basics

1) With a neat block diagram, explain architecture of 8051.
2) With neat schematic interface 8K external data to 8051
3) Explain the memory organization in 8051 controller.
4) Describe each bit of PSW register in detail.
5) What you meant by stack? Explain stack pointer operation.
6) Explain the internal RAM section of 8051 microcontroller with required diagram.
7) Describe interfacing of 8051 with external RAM and ROM.
8) Explain all the addressing modes of 8051 with examples.
9) Show the pin diagram of 8051. Explain functionality of all the pins.
10) Describe different special function registers and their uses in 8051.

Module 2: Assembly programming and instruction of 8051

1) Explain the following instructions with suitable examples.
2) i) SWAP ii) MOVX iii) XCHD iv) DAA. Differentiate between LJMP, AJMP and SJMP instructions.
3) Differentiate between JMP and call instruction. Explain with suitable examples the different ranges associated with call instructions.
4) Differentiate between LJMP, AJMP and SJMP instructions.
5) Explain the following instructions of 8051 with examples.
6) i) XCHD A,@Ri ii)RLA iii) MOVC A, @A+DPTR iv) CJNE A,iram addr, rel addr
7) Describe data type and assembler directives of 8051.
8) Explain different types of conditional and unconditional jump instructions with examples.
9) Why do the PUSH and POP instructions in a subroutine need to be equal in number?
10) Correct the following instructions, If found to have any wrong syntax. Explain the operation of corrected instructions.
    i) MOV #C, 0A ii) MOV A, RS1 iii) MOV A, @R7 iv)MOV 0346H, @R0 v)XCHG B, @R3
11) Show the stack contents, SP contents and contents of any registered affected after each step of the following sequence of operations.

```
MOV SP, #70H
MOV R5, #30H
MOV A, #44H
ADD A, R5
MOV R4, A
PUSH 4
PUSH 5
POP  4.
```

12) What does the following program do? What is the final result in Accumulator? Give the results in terms of functionality.

```
start:  MOV A, R3
        RLA
        ANL A, #0AAH
        PUSH ACC
        MOV A, R3
        RRA
        ANL A, #55H
        MOV R3, A
        POP ACC
        ORL 03H, A
        STMP $
        END
```

Module 3: 8051 programming in C. 8051 Timer programming in Assembly and C

1) Write an ALP to perform the following operation $Z=(X_1+Y_1) * (X_2+Y_2)$. X_1, X_2, Y_1, Y_2 are 8-bit hexadecimal numbers stored in RAM locations. Write a subroutine for the addition and assume that each addition result with 8-bit number.
2) Write an ALP to subtract 37FEH from F845H and save the result in 9600H memory location.
3) Find the period of the machine cycle in each of the different 8051 based systems. i) 11.0592MHz ii) 16 MHz iii) 20MHz. With crystal frequency of 16 MHz, write a program to generate delay of 5ms.
4) Write an ALP to toggle all the bits of P1 for every 300ms. Assume crystal frequency as 22MHz.
5) Write an ALP to load accumulator with the value B6H and complement the content of A 200 times.
6) Write an ALP to subtract two 16 bit numbers.
7) Write a program to find Largest number in a given array of 8 numbers.
8) Write an ALP to toggle all the bits of P1 for every 300ms. Assume crystal frequency as 22MHz.
9) Explain the bit status of TMOD special function register of 8051 timers. And also explain its various modes.
10) Assume XTAL = 11.0592 MHz, Write a program to generate a square wave of 50 Hz frequency on pin P1.3.

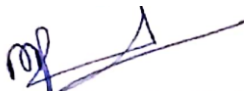
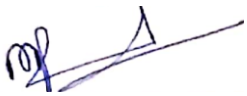
Module 4: 8051 serial port programming in assembly and C. 8051 Interrupt programming in assembly and C

1) Describe different types of interrupts of 8051 with their vector address. Also show the sequence of events that take place on the occurrence of an interrupt.
2) Describe the different types of interrupts with their vector address.
3) Explain briefly the asynchronous serial communication format. And also indicate steps of programming 8051 to transmit a character serially.
4) Write an ALP to transfer the message “VTU” serially continuously at 9600 baud rate, 8-bit data, 1 stop bit.
5) Explain SCON register with its bit pattern. What is the significance of using SBUF register in serial communication?

6) Explain the functions of the pins of 9-pin (DB-9) RS 232 connector. Also describe about RS232 handshaking signals.
7) Write a program to send the data message "EESSA" of the length 5 character at a baud rate 2400, 8 bit data, 1 stop bit serially.
8) Describe serial, parallel, simplex, half duplex and full duplex data transfer.
9) What is serial communication? How serial communication is carried out with RS232 in 8051?

Module 5: Interfacing, ADC, DAC and sensor interfacing, Motor control: Relay, PWM, DC and stepper motor, 8051 interfacing with 8255

1) Draw the pin diagram of ADC0804 with pin description.
2) Interface LCD with 8051 and also write an ALP to display message "DONE".
3) How to Interface DAC with 8051. Explain with figure.
4) Show the H bridge operation in DC motor interfacing.
5) Describe the keyboard interfacing with 8051 along with diagram.
6) Describe DAC interface with diagram and also write C program to generate square wave.
7) Interface 8051 to a stepper motor. And also write an ALP to rotate stepper motor.
8) Interface a 2*4 keys keyboard to 8051 and write an ALP to send the key code to port P1, whenever a key is pressed.
9) Show the interfacing circuit and functional pins of LCD.
10) Describe 8255 interfacing with 8051 with neat diagram.

Prepared by	Checked by		
			
Shri. M. P. Yenagimath	**Shri. M. P. Yenagimath**	**HOD**	**Principal**

Subject Title	**Electric Motors lab**		
Subject Code	BEEL404	**CIE Marks**	50
No of Practical Hrs / Week	03 per batch	**SEE Marks**	50
Total No of Practical Hrs	42	**Exam Hours**	03
			CREDITS – 01

FACULTY DETAILS:		
Name: Prof. S D Hirekodi	**Designation:** Asst. Professor	**Experience: 23** Years
No. of times course taught: 03 Times	**Specialization:** Power Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical & Electronics Engineering	I/II	Basic Electrical Engineering
02	Electrical & Electronics Engineering	IV	Electric Motors

2.0 Course Objectives

- To perform tests on dc machines to determine their characteristics.
- To control the speed of dc motor
- To conduct test for pre-determination of the performance characteristics of dc machines
- To conduct load test on single phase and three phase induction motor.
- To conduct test on induction motor to determine the performance characteristics.
- To conduct test on synchronous motor to draw the performance curves.

3.0 Course Outcomes

The student, after successful completion of the course, will be able to

CO	Course Outcome	RBTL	POs
C221.1	Test dc machines to determine their characteristics.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
C221.2	Change the speed of dc motor by selecting suitable method.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
C221.3	Pre-determine the performance characteristics of dc machines by conducting suitable tests.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
C221.4	Assess the performance of single phase and three phase induction motor by conducting load test.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
C221.5	Experiment with induction motor to pre-determine the performance characteristics.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
C221.6	Test on synchronous motor to draw the performance curves.	L_1-L_4	PO 1,2,3,6,7,8,9,10,12
Total Hours of instruction		**42**	

4.0 Course Content

1. Load test on dc shunt motor to draw speed – torque and horse power – efficiency characteristics.
2. Speed control of dc shunt motor by armature and field control.
3. Swinburne's Test on dc motor.
4. Regenerative test on dc shunt machines.
5. Load test on three phase induction motor.
6. No load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) Circle diagram. Determination of performance parameters at different load conditions.
7. Load test on induction generator.
8. Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
9. Conduct suitable tests to draw the equivalent circuit of single phase induction motor and determine performance Parameters.
10. Conduct an experiment to draw V and Λ curves of synchronous motor at no load and load.
11. Analyze current and load torque of DC Shunt Motor using Simscape.
12. Model 3-phase induction motor using MATLAB and Simulink.

5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	V	Electrical Machine Design	Performance characteristics of DC and synchronous Machines
02	VIII	Project work	Performance testing of Machines used in project work.

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Electrical drives for various industrial applications.

7.0 Books Used and Recommended to Students

Text Books
1. Electric Machines', D. P. Kothari,I. J. Nagrath Mc Graw Hill 4th edition, 2011 2.Electrical Machines M.V. Deshpande PHI Learning 2013 3. Electrical Machines by Ashfaq Hussain Dhanapat Rai and Co. 2013
Reference Books
1.Principles of Electric Machines and power Electronics P.C.Sen Wiley 2nd Edition, 2013

8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. http://www.electrical4u.com 2. www.nptel.com 3. https://www.youtube.com/watch?v=LAtPHANEfQo 4. www.electrical4u.com/testing-of-dc-machine/ 5. http://www.electrical4u.com/working-principle-of-three-phase-induction-motor/ 6. www.electrical4u.com/speed-control-of-three-phase-induction-motor 7. www.electrical4u.com/single-phase-induction-motor 8. www.electricaleasy.com/.../synchronous-motor

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Electric motor magnize	https://www.mtwmag.com/electric-motor-technology-expected-witness-paradigm-shift-2025/
2	Electrical India magazine	https://www.intelligent-power-today.com/

10.0 Examination Note

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks.
The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction and record write-up for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Lab test will be conducted for 100 marks after the completion of all the experiments.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- General rubrics suggested for SEE are writeup-20%, Conduction procedure and result -60%, Viva-voce 20% of maximum marks.
- SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

11.0 Course Delivery Plan

Expt No	Name of the experiment	% of portion
1	Load test on dc shunt motor to draw speed – torque and horse power – efficiency characteristics.	8.33%
2	Speed control of dc shunt motor by armature and field control.	8.33%
3	Swinburne's Test on dc motor.	8.33%
4	Regenerative test on dc shunt machines.	8.33%
5	Load test on three phase induction motor.	8.33%
6	No load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) circle diagram. Determination of performance parameters at different load conditions.	8.33%
7	Load test on induction generator.	8.33%
8	Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.	8.33%
9	Conduct suitable tests to draw the equivalent circuit of single phase induction motor and determine performance parameters.	8.33%
10	Conduct an experiment to draw V and Λ curves of synchronous motor at no load and load.	8.33%
11	Analyze current and load torque of DC Shunt Motor using Simscape.	8.33%
12	Model 3-phase induction motor using MATLAB and Simulink.	8.33%

12.0 QUESTION BANK

1. What will happen if a starting resistance is not provided while starting the dc shunt motor?
2. What you do to reverse the direction of dc shunt motor.
3. Does the direction of dc shunt motor get reversed if the armature current and field current both are reversed?
4. What are the limitations of armature control method for speed control of dc shunt motor.
5. Name the advantages of field control for controlling the speed of a dc shunt motor.
6. Why speed of a dc shunt is motor is practically constant?
7. Discuss, what will happen if the dc shunt motor running on no load has its shunt field winding opened accidentally.
8. Will dc shunt motor start on a.c supply?
9. What are aims of performing a load test on dc shunt motor?
10. Why does the speed of dc shunt motor falls slightly when it is loaded?
11. What can you say about the numerical value of efficiency obtained by Swinburn's test?
12. What is the advantage of Swinburn's test?
13. What are various losses that occur in dc generator?
14. Why Hopkinson's test is also known as regenerative test?
15. How Hopkinson's test is better than Swinburn's test.
16. Compare the power drawn from supply in case of Hopkinson's test and Swinburn's test.
17. What will happen if the shunt field winding of loaded dc shunt motor accidentally breaks?
18. What you mean by V and inverted V curve of synchronous motor.
19. Explain the working principle of three phase Induction Machine.
20. Mention the effects of slip on to the rotor parameters.
21. Draw an equivalent circuit of 3-phase IM, how is this circuit different compare to equivalent circuit of transformer.
22. What is the condition for maximum torque in case of 3-phase IM ?.

Prepared by	Checked by		
18/4/24			
Prof. S. D.Hirekodi	**Prof. Amit Neshti**	**HOD**	**Principal**

Subject Title	**ELECTRIC POWER GENERATION AND ECONOMICS**		
Subject Code	BEE405A	**CIE Marks**	50
Number of Lecture Hrs / Week	3:0:0:0	**SEE Marks**	50
Total Hours of Pedagogy	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. Keshav B Negalur	**Designation:** Asst. Professor	**Experience:**11 years
No. of times course taught: 01		**Specialization:** Industrial Electronics

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical & Electronics Engineering	I/II	BEE
02	Electrical & Electronics Engineering	III	T & G
03	Applied Science	I/II	Engineering Physics

2.0 Course Objectives

- To understand the basics of hydro electric power plant, merits and demerits of hydroelectric power plants, site selection, arrangement and elements of hydro electric plant.
- To understand the working, site selection and arrangement of Steam, Diesel and Gas Power Plants.
- To understand the working, site selection and arrangement of Nuclear Power Plants.
- To understand importance of different equipments in substation, Interconnection of power stations and different types of grounding.
- To understand the economics of power generation.

3.0 Course Outcomes

At the end of the course the student will be able to:

	Course Outcome	RBT Level	POs
CO214.1	Explain the basics of hydro electric power plant, merits and demerits of hydroelectric power plants, site selection, arrangement and elements of hydro electric plant.	L_1, L_2	PO1,PO2, PO6, PO7
CO214.2	Explain the working, site selection and arrangement of Steam, Diesel and Gas Power Plants.	L_1, L_2	PO1,PO2, PO6, PO7
CO214.3	Explain the working, site selection and arrangement of Nuclear Power Plants.	L_1, L_2	PO1,PO2, PO6, PO7
CO214.4	Explain the importance of different equipments in substation, Interconnection of power stations and different types of grounding.	L_1, L_2	PO1,PO2,PO6, PO7,PO10
CO214.5	Explain the economics of power generation.	L_1, L_2, L_3, L_4	PO1,PO2, PO6, PO7
Total Hours of instruction		**40**	

4.0 Course Content

Module-1

Hydroelectric Power Plants: Hydrology, Run off and stream flow, Hydrograph, Flow duration curve, Mass curve, Reservoir capacity, Dam storage. Hydrological cycle, Merits and demerits of hydroelectric power plants, Selection of site. General arrangement of hydel plant, Elements of the plant, Classification of the plants based on water flow regulation, Water head and type of load the plant has to supply. Water turbines – Pelton wheel, Francis, Kaplan and propeller turbines. Characteristic of water turbines governing of turbines, Selection of water turbines. Underground, Small hydro and pumped storage plants. Choice of size and number of units, Plant layout and auxiliaries. 10 Hours

Module-2

Steam Power Plants: Introduction, Efficiency of steam plants, Merits and demerits of plants, Selection of site. Working of steam plant, Power plant equipment and layout, Steam turbines, Fuels and fuel handling, Fuel combustion and combustion equipment, Coal burners, Fluidized bed combustion, Combustion control, Ash handling, Dust collection, Draught systems, Feed water, Steam power plant controls, Plant auxiliaries.

Diesel Power Plant: Introduction, Merits and demerits, Selection site, Elements of diesel power plant, Applications.

Gas Turbine Power Plant: Introduction Merits and demerits, Selection site, Fuels for gas turbines, Elements of simple gas turbine power plant, Methods of improving thermal efficiency of a simple steam power plant, closed cycle gas turbine power plants. Comparison of gas power plant with steam and diesel power plants. 10Hours

Module 3

Nuclear Power Plants: Introduction, Economics of nuclear plants, Merits and demerits, selection of site, Nuclear reaction, Nuclear fission process, Nuclear chain reaction, Nuclear energy, Nuclear fuels, Nuclear plant and layout, Nuclear reactor and its control, Classification of reactors, Power reactors in use, Effects of nuclear plants, Disposal of nuclear waste and effluent, Shielding. 10Hours

Module-4

Substations: Introduction to Substation equipment; Transformers, High Voltage Fuses, High Voltage Circuit Breakers and Protective Relaying, High Voltage Disconnect Switches, Lightning Arresters, High Voltage Insulators and Conductors, Voltage Regulators, Storage Batteries, Reactors, Capacitors, Measuring Instruments and power line carrier communication equipment. Classification of substations – indoor and outdoor, Selection of site for substation, Busbar arrangement schemes and single line diagrams of substations. Interconnection of power stations. Introduction to gas insulated substation, Advantages and economics of Gas insulated substation.

Grounding: Introduction, Difference between grounded and ungrounded system. System grounding – ungrounded, Solid grounding, Resistance grounding, Reactance grounding and resonant grounding. Earthing transformer. Neutral grounding and neutral grounding transformer. 10Hours

Module-5

Economics: Introduction, Effect of variable load on power system, classification of costs, Cost analysis. Interest and Depreciation, Methods of determination of depreciation, Economics of Power generation, different terms considered for power plants and their significance, load sharing. Choice of size and number of generating plants. Tariffs, objective, factors affecting the tariff, types. Types of consumers and their tariff. Power factor, Disadvantages and causes of low power factor, Methods of improving power factor, Economics of power factor improvement and comparison of methods of improving the power factor. Choice of equipment. 10Hours

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Students can apply the knowledge of different type's power plant construction & working principle to implement their projects.
02	VIII	Seminar work	Students can utilize the basic knowledge of different types of power plants during seminar preparation.

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Economics of Nuclear power plants.
02	Basic knowledge of single line diagram of substations & different types of protective devices.
03	Basic Knowledge of Site selection for different types of power plants.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Industrial Visit	To Meet Industry/Profession Requirements For Effective Learning Of Practical Operation Of The Generating Stations (Diesel, Thermal, Hydroelectric Power Plants) through Industrial Visit.
02	NPTEL Classes.	Awareness towards to the Importance of High Load Factor.

8.0 Books Used and Recommended to Students

Text Books

- Power Plant Engineering by P.K. Nag Mc Graw Hill 4th Edition, 2014.
- Generation of Electrical Energy by B.R.Gupta S. Chand 2015.
- Electrical power Generation, Transmission and Distribution by S.N. Singh PHI 2nd Edition, 2009.

Reference Books

- A Course in Power Systems by J.B. Gupta Katson 2008.
- Electrical Power Distribution Systems by V. Kamaraju Mc Graw Hill 1st Edition, 2009.
- A Text Book on Power System Engineering by A.Chakrabarti, et al Dhanpath Rai 2nd Edition, 2010.
- Electrical Distribution Engineering Anthony by J.Pansini CRC Press 3rd Edition, 2006.
- Electrical Distribution Systems by Dale R Patrick Et al CRC Press 2nd Edition, 2009.

Additional Study material & e-Books

- M V Deshpande, Elements Of Electrical Power Station Design, Phi
- P.S. Pabla, Electric Power Distribution, Tata Mcgraw Hill
- D P Kothari And I J Nagrath , Power System Engineering:, Tata Mcgraw Hil
- S N Singh, Electric Power Generation, Transmission And Distribution, Phi Reference Books.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

1) libguides.library.qut.edu.au/energy/powereng
2) http://NPTEL.com
3) www.electrical4u.com

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	Website
1	Power Magazine Business & Technology for the Global Generation Industry Since 1882	www.powermag.com
2	Renewable energy Journal Elseiver.	https://www.journals.elsevier.com/renewable-energy/
3	IEEE xplore:IEEE power & Energy Magazine	ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8014

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered.
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of Sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

12.0 Course Delivery Plan

Module No	Lecture No.	Content of Lecturer	% of Portion
Module 1		**PART - A**	
	1	**Hydroelectric Power Plants:** Hydrology, Run off and stream flow.	20%
	2	Hydrograph Flow duration curve, Mass curve, Reservoir capacity, Dam storage.	

	3	Hydrological cycle, Merits and demerits of hydroelectric power plants, Selection of site.	
	4	General arrangement of hydel plant, Elements of the plant.	
	5	Classification of the plants based on water flow regulation, Water head and type of load the plant has to supply.	
	6	Water turbines – Pelton wheel, Francis.	
	7	Kaplan and propeller turbines.	
	8	Characteristic of water turbines Governing of turbines, Selection of water turbines.	
	9	Underground, Small hydro and pumped storage plants.	
	10	Choice of size and number of units, Plant layout and auxiliaries.	
Module 2	11	**Steam Power Plants:** Introduction, Efficiency of steam plants, Merits and demerits of plants, Selection of site.	20%
	12	Working of steam plant, Power plant equipment and layout, Steam turbines, Fuels and fuel handling.	
	13	Fuel combustion and combustion equipment, Coal burners, Fluidized bed combustion, Combustion control.	
	14	Ash handling, Dust collection, Draught systems, Feed water, Steam power plant controls, Plant auxiliaries.	
	15	**Diesel Power Plant:** Introduction, Merits and demerits.	
	16	Selection site, Elements of diesel power plant, Applications.	
	17	**Gas Turbine Power Plant**: Introduction, Merits and demerits.	
	18	Selection site, Fuels for gas turbines, Elements of simple gas turbine power plant.	
	19	Methods of improving thermal efficiency of a simple steam power plant, Closed cycle gas turbine power plants.	
	20	Comparison of gas power plant with steam and diesel power plants.	
Module 3	21	**Nuclear Power Plants:** Introduction, Economics of nuclear plants.	20%
	22	Merits and demerits, selection of site.	
	23	Nuclear reaction, Nuclear fission process, Nuclear chain reaction.	
	24	Nuclear energy, Nuclear fuels.	
	25	Nuclear plant and layout, Nuclear reactor and its control.	
	26	Classification of reactors, Power reactors in use.	
	27	Effects of nuclear plants.	
	28	Disposal of nuclear waste and effluent, Shielding.	
Module 4	29	**Substations:** Introduction to Substation equipment; Transformers, High Voltage Fuses.	20%
	30	High Voltage Circuit Breakers and Protective Relaying, High Voltage Disconnect Switches, Lightning Arresters	
	31	High Voltage Insulators and Conductors, Voltage Regulators, Storage Batteries, Reactors, Capacitors.	
	32	Measuring Instruments and power line carrier communication equipment.	
	33	Classification of substations – indoor and outdoor, Selection of site for substation, Bus bar arrangement schemes and single line diagrams of substations.	
	34	Interconnection of power stations. Introduction to gas insulated substation, Advantages and economics of Gas insulated substation.	
	35	**Grounding:** Introduction, Difference between grounded and ungrounded system.	
	36	System grounding – ungrounded, Solid grounding, Resistance grounding, Reactance grounding and resonant grounding.	
	37	Earthing transformer. Neutral grounding and neutral grounding transformer.	
Module 5	38	**Economics:** Introduction, Effect of variable load on power system,	
	39	Classification of costs, Cost analysis.	20%
	40	Interest and Depreciation, Methods of determination of depreciation,	
	41	Economics of Power generation, different terms considered for power plants and their significance, load sharing.	
	42	Choice of size and number of generating plants. Tariffs, objective.	
	43	Factors affecting the tariff, types. Types of consumers and their tariff.	
	44	Power factor, Disadvantages and causes of low power factor, Methods of improving power factor.	
	45	Economics of power factor improvement and comparison of methods of improving the power factor. Choice of equipment.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Hydroelectric power plants	Students are capable to identify different types of water turbines & understand the working of different hydro power plants.	Module 1	2	Individual Activity. Written solution expected.	Book 1, 3, 4 of the text book list. Website of the Reference list
2	Assignment 2: University Questions on Steam power plants, Diesel power plant, Gas turbine power plant.	Students understand the working of steam & diesel power plants.	Module 2	4	Individual Activity. Written solution expected.	Book 1, 3, 4 of the text book list. Website of the Reference list
3	Assignment 3: University Questions on Nuclear power plants.	Students explain the operation of Nuclear power plant & Nuclear fission process.	Module 3	6	Individual Activity. Written solution expected.	Book 1, 3, 4 of the text book list. Website of the Reference list
4	Assignment 4: University Questions on Substations.	Students are capable to identify different types of protective devices & lightning arresters.	Module 4	8	Individual Activity. Written solution expected.	Book 1, 3, 4 of the text book list. Website of the Reference list
5	Assignment 5: University Questions on Economics.	Students are capable to elaborate causes of low power factor & different power factor improvement methods.	Module 5	10	Individual Activity. Written solution expected.	Book 1, 3, 4 of the text book list. Website of the Reference list

14.0 QUESTION BANK

MODULE 1: HYDROELECTRIC POWER PLANTS

1. Explain the factors to be considered for the selection of site for hydroelectric power plant?
2. Mention the classification of hydel power plants?
3. Define Flow duration curve & Mass curve?
4. Explain merits & demerits of hydroelectric power plants?
5. With neat sketch explain the working of Francis, Kaplan and propeller turbine?
6. Write a note on selection of water turbines?
7. Explain small hydro power plant?
8. Define hydrology, run off & stream flow?
9. Define i) hydrograph ii) flow duration curve and mass curve?
10. Explain the essential elements of hydro power plant with neat schematic diagram?
11. Explain the governing mechanism of hydraulic impulse turbine and reaction turbine with neat sketches?
12. Explain the classification of hydroelectric power plant based on water head?
13. Explain the components of high head hydroelectric power plant with its schematic arrangement?
14. Describe different turbines and their use in hydroelectric plants?
15. How the Hydro plants are classified? Explain in detail?

MODULE 2: STEAM POWER PLANTS, DIESEL & GAS TURBINE POWER PLANT

1. Write a note on merits & demerits of steam power plant?
2. Explain the selection of site for steam power plant?

3. With neat sketch explain the working of steam plant?
4. Write a note on steam turbines?
5. Write a note on merits & demerits of Diesel power plant?

1. Mention the elements of diesel power plant & applications?
2. Mention merits & demerits of Gas turbine power plant?
3. Explain the methods of improving thermal efficiency of a simple steam power plant?
4. Explain Closed cycle gas turbine power plant?
5. Write comparison of gas power plant with steam & diesel power plant?
6. Explain the techniques of dust collection in thermal power station?
7. Explain the function of air-preheater and economizer in thermal plant?
8. Mention the application of Diesel power plant?
9. With neat sketch explain the working of a gas turbine plant?
10. Mention the advantages & disadvantages of Diesel power plant?
11. Mention the classification of stokers?
12. Write short notes on
    1)Electrostatic precipitator
    2)Underfeed stokers.
13. Draw the schematic diagram for modern steam power station and explain its operation with its important components?
14. Draw the layout of diesel power plant showing the various systems, including cooling, lubrication, starting, intake and exhaust systems?

MODULE 3: NUCLEAR POWER PLANTS

1. What are the Economics of Nuclear power plants?
2. Mention merits & demerits of Nuclear power plant?
3. Explain site selection procedure for Nuclear power plant?
4. Write a note on Nuclear reaction & Nuclear chain reaction?
5. Explain Nuclear fission process?
6. Explain Nuclear reactor & its control?
7. Write a note classification of reactors?
8. Explain effects of Nuclear plants?
9. Explain how disposal of Nuclear waste and effluent is performed?
10. Describe construction and working of a Pressurized water reactor?
11. Explain the working operation of Nuclear power plant with neat sketch?
12. Give the various classifications of Nuclear reactor and explain each?
13. Explain the function of moderator, control rod, coolant in nuclear power plant?
14. Write briefly about Nuclear waste disposal?
15. Explain the Boiling water reactor with diagram?
16. With examples explain the difference between a fissible material and a fertile material?
17. Explain the function of moderator, coolant, control rod and shielding in nuclear power plant?
18. Describe the different types of fuels used in Nuclear power plant and discuss the problem of nuclear waste disposal?

MODULE 4: SUBSTATIONS, GROUNDING

1. Write a note on
    1) High voltage fuses
    2) High voltage circuit breakers
    3) Lightning arresters
    4) High voltage insulators & conductors.
2. Explain Measuring instruments & power line carrier communication equipments used in substations?
3. Explain indoor and outdoor substations?

4. With neat sketch explain Gas insulated substation?
5. Mention advantages & economics of Gas insulated substation?
6. Write a note on site selection procedure for substation?
7. Differentiate between grounded and ungrounded system?
8. Explain resistance grounding and reactance grounding?
9. Explain Neutral grounding transformer?
10. Write a note on earthing transformer?
11. Explain resonant grounding with a neat diagram?
12. Explain the function of transformer, high voltage circuit breaker & high voltage insulator in substation?
13. Draw a neat single line diagram of substation & explain it?
14. Define substation & mention different types of substations?
15. Explain double bus without sectionlisation?
16. With neat sketch explain the single bus bar system?
17. Explain the interconnection of power station with its advantages and disadvantages?
18. Explain Gas insulated substation and mention its advantages?
19. Explain the Earthing Transformer with neat diagram?

MODULE 5: ECONOMICS

1. Explain the effect of variable load on power system?
2. Explain the classification of cost, cost analysis?
3. Write a note on Interest and Depreciation?
4. Explain different methods for determination of Depreciation?
5. Write a note on economics of power generation?
6. Define Tariff, explain types of Tariffs?
7. Define power factor and mention disadvantages & causes of low power factor?
8. Explain the methods of improving power factor?
9. Write a note on Economics of power factor improvement?
10. Explain the comparison of different methods of improving the power factor?
11. Define the fallowing terms i)Load factor ii)diversity factor iii)plant use factor ?
12. Explain the factors affecting tariff?
13. Calculate the annual energy cost of an industrial consumer who takes a load of 20KW for 1 hour per day, 150KW for 7 hours and 50KW for 8hours/day. The tariff in force is Rs.20per kilowatt of maximum demand and 10paise per KWH. Assume 6 working days in a weak?
14. A generating station has 3*50MW units. The station output is 876*10^6 KWH per annum. The maximum demand is 120MW. Calculate
    1) Average load on the station
    2) Annual load factor
    3) Annual capacity factor
15. Mention the measures by which low power factor can be avoided?
16. Discuss the Economics of power factor correction?
17. What are the main objectives in framing a Tariff?
18. Explain the types of consumers and write the general form of Tariff?
19. Write a short note on classification of costs?
20. Explain the concept of load sharing and choice of size and number of generating plants?

Prepared by	Checked by		
Prof. Keshav Negalur	**Prof. S D Hirekodi**	**HOD**	**Principal**

Subject Title	**SCILAB/MATLAB FOR ELECTRICAL MEASUREMENTS LABORATORY**		
Subject Code	BEEL456B	**CIE Marks**	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	**SEE Marks**	50
Credit	01	**Exam Hours**	02

FACULTY DETAILS:		
Name: Prof. O. B. Heddurshetti	**Designation:** Asst. Professor	**Experience:**17 Years
No. of times course taught:01	**Specialization:** Power Electronics	
Name: Prof. K. B. Negalur	**Designation:** Asst. Professor	**Experience:**11Years
No. of times course taught:01	**Specialization:** Industrial Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electrical and Electronics Engineering	I/II	Basic Electrical Engineering
02	Electrical and Electronics Engineering	III	Electric Circuit Analysis
03	Electrical and Electronics Engineering	III	Analog Electronic Circuit

2.0 Course Objectives

- Along with prescribed hours of teaching –learning process, provide opportunity to perform the experiments/programmes at their own time, at their own pace, at any place as per their convenience and repeatany number of times to understand the concept.
- Provide unhindered access to perform whenever the students wish.
- Vary different parameters to study the behaviour of the circuit without the risk of damaging equipment/ device or injuring themselves.

3.0 Course Outcomes

The student, after successful completion of the course, will be able to

CO	Course Outcome	RBT Level	POs
C227.1	Design and analyze measurement of resistance, inductance, capacitance and frequency by using different types of bridges	L4	1,2,3,8, 9,10,12
C227.2	Design and analyze the measurement of power, energy, flux and flux density in single phase and three phase circuits.	L3	1,2,3,8, 9,10,12
C227.3	Test and analyze CT and VT using silsbees deflection method.	L4	1,2,3,8, 9,10,12
C227.4	Design and analyze measurement of voltage using true RMS reading and digital voltmeters.	L4	1,2,3,8, 9,10,12
C227.5	Design and analyze measurement of Quality factor of an Electrical circuit using Q meter.	L3	1,2,3,8, 9,10,12

4.0 Course Content

Sl. No.	Experiments
1	Design and Analysis of measurement of Resistance using Wheatstone and Kelvins double bridge.
2	Design and Analysis of measurement of Capacitance using Schering and De-Sauty's Bridges.
3	Design and Analysis of measurement of Inductance using Maxwells and Anderson Bridges.
4	Design and Analysis of measurement of Frequency using Wein's bridge.
5	Design and Analysis of measurement of Real Power, Reactive and Power Factor in Three Phase Circuits.
6	Design and Analysis of measurement of Energy in Three Phase Circuits.
7	Design and Analysis of measurement of Flux and Flux density.
8	Testing and Analysis of Current Transformer using Silsbees Deflection Method.
9	Testing and Analysis of Voltage Transformer using Silsbees Deflection Method.
10	Design and Analysis of True RMS Reading Volt Meters.
11	Design and Analysis of Integrating and Successive approximation type Digital Volt Meters.
12	Design and Analysis of Q Meter.

5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	VI, VII &VIII	Project work	Use of Scilab Software

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Measurement of Electrical quantities in Industry.

7.0 Books Used and Recommended to Students

Text Books
1. A. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpatrai and Sons, New Delhi.
Reference Books
1. Cooper D. and A.D. Heifrick, "Modern Electronic Instrumentation and Measuring Techniques", P.H.I.

8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1) https://scilab.in/textbook_run/1376/7/5 2) https://www.academia.edu/63830014/Scilab_Textbook_Companion_for_Electronic_Instrumentation_by_H_S_Kalsi

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	IFAC 9th Proceedings	https://www.sciencedirect.com/science/article/pii/S1474667015376047
2	NPTEL course on Measurements	https://archive.nptel.ac.in/courses/108/105/108105153/

10.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).
- The Sum of scaled-down marks scored in

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in - 60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero. The duration of SEE is 03 hours

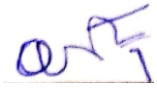
11.0 Course Delivery Plan

Expt. No	Practical No	Name of the Experiment	% of Portion
1	1	Design and Analysis of measurement of Resistance using Wheatstone and Kelvins double bridge.	8.33
2	2	Design and Analysis of measurement of Capacitance using Schering and De-Sauty'sBridges.	8.33
3	3	Design and Analysis of measurement of Inductance using Maxwells and Anderson Bridges.	8.33
4	4	Design and Analysis of measurement of Frequency using Wein's bridge.	8.33
5	5	Design and Analysis of measurement of Real Power, Reactive and Power Factor in Three Phase Circuits.	8.33
6	6	Design and Analysis of measurement of Energy in Three Phase Circuits.	8.33
7	7	Design and Analysis of measurement of Flux and Flux density.	8.33
8	8	Testing and Analysis of Current Transformer using Silsbees Deflection Method.	8.33
9	9	Testing and Analysis of Voltage Transformer using Silsbees Deflection Method.	8.33
10	10	Design and Analysis of True RMS Reading Volt Meters.	8.33
11	11	Design and Analysis of Integrating and Successive approximation type Digital Volt Meters.	8.33
12	12	Design and Analysis of Q Meter.	8.33

12.0 QUESTION BANK

1. Classify resistance.
2. What is the range of medium resistance?
3. Name the methods used for low resistance measurement.
4. Name the methods used for medium resistance measurement
5. Where high resistance m/s is required?
6. State the advantages of Wheatstone bridge method.
7. State the advantages of Kelvin double bridge method.
8. What are the constructional features of doctor ohmmeter?
9. Define megger.
10. Name the parts of megger.
11. What is the range of low resistance?
12. What is the range of medium resistance?
13. What ranges of resistance can be measured by using doctor ohmmeter?
14. How resistance is measured in direct deflection method?
15. Classify the cables according to their sheathing.
16. Name the leads present in megger.
17. How resistance is measured by using ohm meter method?
18. How resistance is measured in loss of charge method?
19. State the balance equation used in bridge methods.
20. State the advantages of price's guard wire method.
21. How the earth resistance is measured?
22. State the use of ac bridges.
23. State the balance equation used in ac bridges.
24. Name the bridge circuits used for the m/s of self inductance.
25. Name the bridge circuits used for the m/s of capacitance.
26. Name the bridge circuits used for the m/s of mutual inductance.
27. Which type of detector is used in ac bridges?
28. Name the ac sources used in ac bridges.
29. In which cases audio frequency oscillators are used as ac source.
30. Name the sources of errors in ac bridge m/s.
31. State the advantages of Maxwell-weinbridge.
32. State the disadvantage of Maxwell-weinbridge.
33. State the disadvantages of Hay's bridge.

34. State the use of Weinbridge.
35. What is the use of Campbell bridge?
36. What is meant by inductometer?
37. Define Q-factor of the coil.
38. Name the components of iron loss.
39. Name the faults that occurs in cables.
40. Name the loop test methods used in location of fault.
41. How leakage errors are minimized in ac bridge circuits?
42. (i) Explain Kelvin's double bridge method for the measurement of low resistance.
    (ii) Explain how inductance in measured by using Maxwell's bridge.
43. State the advantages of instrument transformers.
44. State the disadvantage of instrument transformers.
45. What are the constructional parts of current transformer?
46. Name the errors caused in current transformer.
47. Define ratio error.
48. How the phase angle error is created?
49. State the use of potential transformer.
50. Name the errors caused in potential transformer.
51. How the CT and PT are connected in the circuits?
52. What are the functional elements of an instruments?
53. What is meant by accuracy of an instrument?
54. Write the function of instrument transformer.
55. Why an ammeter should have a low resistance?
56. What are the constructional parts of dynamometer type wattmeter?
57. Write down the deflecting torque equation in dynamometer type wattmeter.
58. State the disadvantages of Dynamometer type wattmeter.
59. Name the errors caused in Dynamometer type wattmeter.
60. How the errors caused by pc inductance is compensated?
61. How the errors caused by methods of connection is compensated By using compensating coil?
62. Name the methods used for power measurement in three phase circuits.
63. What are the special features to be incorporated for LPF wattmeter?
64. Define Phantom loading.
65. State the use of phantom loading.
66. Name the methods used in Wattmeter calibration.
67. What are the types of energy meters?
68. Name the constructional parts of induction type energy meter.
69. How voltage coil is connected in induction type energy meter?
70. How current coil is connected in induction type energy meter?
71. Why Al disc is used in induction type energy meter?
72. What is the purpose of registering mechanism?
73. What is the purpose of braking mechanism?
74. Define creeping.
75. State the reason why holes are provided in Al disc.
76. (i) Explain the working principle of moving iron instrument. (ii) Give a detailed notes on Instrument transformers.
77. Discuss in detail the working of the successive approximation DVM With a neat diagram, explain the various methods of magnetic measurements.
78. With a neat diagram explain the construction and working of electrodynamometer type instruments. Also derive its torque equation.
79. Explain with neat diagram the working of Linear ramp type DVM.
80. Explain the different methods of determination of B –H curve With a neat block diagram explain the working principle of digital frequency meter.

Prepared by	Checked by		
			
Prof. K. B. Negalur	**Prof. O. B. Heddurshetti**	**for HOD**	**Principal**

Subject Title	Biology for Engineers		
Subject Code	BBOK407	**CIE Marks**	50
		SEE Marks	50
Number of Lecture Hrs/ Week	3	**Total Marks**	100
Total Number of Lecture Hrs	40 hours Theory	**Exam Hours**	03
		CREDITS – 03	

FACULTY DETAILS:		
Name: Dr. S. J. Walaki	**Designation:** Assistant Professor	**Experience:** 8.0 Years
No. of times course taught: 02 (including Present)	**Specialization:** Physical Chemistry	

1.0 Prerequisite Subjects:

To familiarize the students with the basic biological concepts and their engineering applications

Sl. No	Branch	Semester	Subject
01	Common to all	IV	Biology for Engineers

2.0 Course Objectives

To provide students with knowledge of Biology for building technical competence in industries, research and development in the following fields

1. To familiarize the students with the basic biological concepts and their engineering applications.
2. To enable the students with an understanding of biodesign principles to create novel devices and structures.
3. To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. To motivate the students develop the interdisciplinary vision of biological engineering.

3.0 Course Outcomes

On completion of this course, students will have knowledge in:

	Course Outcome	POs	RBT Levels
CO1	To familiarize the students with the basic biological concepts and their engineering applications.	1,2,3,& 7	L3
CO2	To enable the students with an understanding of biodesign principles to create novel devices and structures.	1,2,3, & 7	L1 &L2
CO3	To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.	1,2,3, & 7	L3
CO4	To motivate the students to develop interdisciplinary vision of biological engineering.	1,2,3, & 7	L3
CO5	Understand the Trends of Bioengineering	1,2,3, & 7	L1&L2
Total Hours of instruction		**40**	

4.0 Course Content

Module-1: INTRODUCTION TO BIOLOGY:
The cell: the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules; Enzymes (Classification (with one example each),Properties and functions), vitamins and hormones.

Module 2: BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE)::
Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes
(glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).

Module 3: HUMAN ORGAN SYSTEMS AND BIO DESIGNS (QUALITATIVE): (Qualitative):
Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).

Module 4: NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (Qualitative):
Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).

Module 5: TRENDS IN BIOENGINEERING (Qualitative):
Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis), scaffolds and tissue engineering, Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Self- healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	IV	**Biology for Engineers** (Common to all Engineering subjects)	Introduction to fundamental aspects of Biology for Engineers in IV semester Students will learn about the demand for improvement in medical and biological studies and research, it has become important to use technology. One can easily transform biological data and information into a realistic approach. Biology for Engineers has made it possible to understand the living world in depth. It is a broad area of study which has successfully brought great advancements in our lives. Interestingly, the ever-changing and diverse field has led humans to achieve scientific excellence. India has geared to be an International player in life sciences.

6.0 Relevance to Real World

SL.No	Real World Mapping
01	To illustrates many potential applications of biology for engineering, and to demonstrates the possible use and impact of these tools and technologies to address and overcome societal challenges, through a focus on five sectors: 1) Industrial Biotechnology; 2) Health & Medicine; 3) Food & Agriculture; 4) Environmental Biotechnology; and 5) Energy.
02	To frame these possibilities through the lens of solving pervasive societal challenges, including enabling and establishing a cleaner environment, supporting the health and well-being of growing populations, and accelerating innovation and economic viability of industry.
03	Science and engineering aims and objectives for biology for engineering that may be necessary or instrumental to overcoming the challenge and identify potential discrete technical achievements towards the objective.
04	Engineering departments in which students work in teams to tackle a "real-world" engineering design problem related to biological sciences.
05	As our engineering toolkit in bio expands to be more powerful than ever before, and the infrastructure to deliver, produce, and scale these solutions, a whole new world of problems in biology begin to feel approachable.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource	Each module/ Chapter presentation

8.0 Books Used and Recommended to Students

Suggested Learning Resources: Textbooks/ Reference Books

1. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
2. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
3. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
9. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019.
10. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
11. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Additional Study material & e-Books

1. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
2. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
3. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016 .
4. Blood Substitutes, Robert Winslow, Elsevier, 2005

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

1. https://nptel.ac.in/courses/121106008
2. https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
3. https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
4. https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
5. https://www.coursera.org/courses?query=biology
6. https://onlinecourses.nptel.ac.in/noc19_ge31/preview
7. https://www.classcentral.com/subject/biology
8. https://www.futurelearn.com/courses/biology-basic-concepts

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Group Discussion of Case studies
2. Model Making and seminar/poster presentations
3. Design of novel device/equipment like Cellulose-based water filters, Filtration system

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	**Journal of Theoretical Biology**	https://www.sciencedirect.com/journal/journal-of-theoretical-biology
2	**Journal of Virology**	https://journals.asm.org/journal/jvi

11.0 Examination Note

Assessment Details (both CIE and SEE)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers

for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 2 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas thepractical portion will have a CIE component only. Questions mentioned in the SEE paper shallinclude questions from the practical component).

SCHEME OF EXTERNAL EXAMINATION:

Ten main questions to be set in question paper. Each main question will carry 20 marks. Student has to answer either 1 or 2 main question. It will continue up to 10th question.

Module I– Question 1(a,b) or 2(a,b) = 20Marks
Module II – Question 3(a,b) or 4(a,b) = 20Marks
Module III– Question 5(a,b) or 6(a,b) = 20Marks
Module IV – Question 7(a,b) or 8(a,b) = 20Marks
Module V – Question 9(a,b) or 10(a,b) = 20Marks
Total = 100Marks

INSTRUCTION FOR Biology for Engineers (BBOK407) EXAMINATION

1. The total exam duration is 3 hours.
2. Use black ink pen for writing examination
3. Drawing should be drawn from dark pencil.
4. Read the questions carefully.
5. Answer the questions up to the point.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
I	1	The cell: the basic unit of life, Structure and functions of a cell	20.0
	2	The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application.	
	3	Biomolecules: Properties and functions of Carbohydrates, Nucleic acids,	
	4	proteins, lipids. Importance of special biomolecules;	
	5	Enzymes (Classification (with one example each),Properties and functions), vitamins and hormones.	
II	1	Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics),	20.0
	2,	Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19	
	3	Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins),	
	4	lipids (biodiesel, cleaning agents/detergents),	
	5	Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).	
3	1	Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics	20.0
	2	Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye).	
	3	Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).	
	4	Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung	

		machine).	
	5	Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).	
4	1	Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf).	**20.0**
	2	Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces),	
	3	Plant burrs (Velcro), Shark skin (Friction reducing swim suits),	
	4	Kingfisher beak (Bullet train).	
	5	Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).	
5	1	Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis),	**20.0**
	2	scaffolds and tissue engineering, Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods.	
	3	Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis	
	4	Self- healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation	
	5	Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).	

13.0 QUESTION BANK

MODULE-I INTRODUCTION TO BIOLOGY:

1. Define cell. Explain Characteristics of Cells.
2. Explain structure and functions of Prokaryotic Cells (With diagram)
3. Explain structure and functions of Eukaryotic Cells (With diagram))
4. Explain the applications of Prokaryotic Cells
5. Explain the applications of Eukaryotic Cells
6. Define stem cells. Explain the following types of stem cells
   a) Embryonic Stem Cells
   b) Adult Stem Cells
   c) Induced Pluripotent Stem Cells
   d) Mesenchymal stem cells
7. Explain the applications of stem cells:
8. What are carbohydrates? Explain properties and functions of Carbohydrates.
9. What are Nucleic acids? Explain properties and functions of Nucleic acids.
10. Define Biomolecules. Explain the structure (types) of Nucleic Acids.
11. Define Biomolecules. Explain the structure (types) of carbohydrates.
12. What are carbohydrates? Explain Classification of carbohydrates
13. Explain industrial applications of Carbohydrates
14. Explain properties, advantages and limitations of cellulose based water filter
15. Explain Construction of cellulose-based water filters
16. Explain with suitable diagram water filtration using cellulose membrane
17. Discuss the potential of cellulose based water filters addressing water pollution issues. What are its advantages and limitations
18. Explain properties and Engineering applications of PHA bioplastic.
19. Explain properties and Engineering applications of PLA bioplastic.
20. What are Nucleic Acids? Explain two types of nucleic acids (DNA and RNA)
21. Describe the following i) RNA Vaccines for Covid19 ii) DNA Fingerprinting.
22. Write a note on DNA vaccine.
23. Explain DNA vaccine for rabies and

24. Write a note on RNA vaccine
25. Explain RNA Vaccines for Covid19 with its importance.

MODULE 2: Human Organ Systems and Bio Designs - 1 (Qualitative):

1. Compare and contrast the central nervous system(CNS) and the Peripheral Nervous System in terms of their structure and functions.
2. Discuss the types of brain activity that can be detected with EEG.
3. Explain the architecture of Rod and Cone cells with neat diagram
4. Discuss the reasons for blockages of blood vessels
5. Discuss the defibrillators
6. Discuss the design of stents
7. Explain the , pace makers
8. Discuss the following optical corrections, cataract, lens materials, bionic eye.

MODULE 3: Human Organ Systems and Bio Designs – 2

1. Explain Lungs as purification system (architecture, gas exchange mechanisms
2. Explain abnormal lung physiology – COPD
3. Discuss with neat sketch Heart-lung machine
4. Write a note on Ventilators
5. Explain the mechanism of human Kidney as a filtration system
6. Write a note on bioengineering solutions muscular dystrophy and osteoporosis
7. Explain the CKD, dialysis systems

MODULE 4: Nature-Bio-inspired Materials and Mechanisms (Qualitative):

1. Explain the following i) ultrasonography ii) sonars
2. Discuss the following photovoltaic cells and bionic leaf
3. Discuss the potential applications of shark skin inspired swim suits.
4. Discuss the potential applications of Lotus leaf effect (Super hydrophobic and self-cleaning surfaces).
5. Write short note on the hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).
6. Write a note on Bird flying (GPS and aircrafts)
7. Write a note on Kingfisher beak (Bullet train).

MODULE 5: Trends in Bioengineering (Qualitative):

1. Write a short on Bioprinting techniques and materials.
2. Explain 3D printing of ear, bone and skin
3. Write a short on Electrical tongue and electrical nose in food science.
4. Explain Bioimaging and Artificial Intelligence for disease diagnosis.
5. Describe the concept Self-healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes.
6. Explain the process of Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

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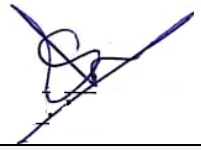		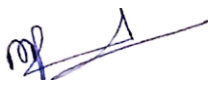	
Dr. S. J. Walaki	**Dr. M. S. Hanagadakar**	**HOD**	**Principal**

Subject Title	Universal Human Values (UHV)		
Subject Code	BUHK408	**CIE Marks**	50
Teaching Hrs / Week (L: T:P: S)	1:0:0:1	**SEE Marks**	50
Total Hrs of Pedogogy	15 hour Theory Session +15 hour Self study	**Exam Hours**	01
			CREDITS – 01

FACULTY DETAILS:		
Name: Prof. S.G.Huddar	**Designation:** Asst. Professor	**Experience: 10** Years
No. of times course taught: 02 Times	**Specialization:** Power System Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	None	--	--

2.0 Course Objectives

This introductory course input is intended:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

This course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

3.0 Course Outcomes

By the end of the course, students are expected to positively impact common graduate attributes like:

CO	Course Outcome	Cognitive Level	POs
C231.1	Appreciation and aspiration for excellence (merit) and gratitude for all	L_2	PO6, PO7 PO8, PO10,PO12
C231.2	Having Competence and Capabilities for Maintaining Health and Hygiene	L_2	PO6, PO7 PO8, PO10,PO12
C231.2	Socially responsible behavior.	L_2	PO6, PO7 PO8, PO10,PO12
C231.4	Environmentally responsible work.	L_2	PO6, PO7 PO8, PO10,PO12
C231.5	Holistic vision of life and Ethical human conduct	L_2	PO6, PO7 PO8, PO10,PO12
Total Hours of instruction		**15**	

4.0 Course Content

Module-1

Introduction to Value Education (4 hours) Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

Module-2

Harmony in the Human Being (4 hours) Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Module-3

Harmony in the Family and Society (4 hours) Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Module-4

Harmony in the Nature/Existence (4 hours) Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Module-5

Implications of the Holistic Understanding – a Look at Professional Ethics (4 hours) Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

5.0 Relevance to future subjects:

SL. No	Semester	Subject	Topics / Relevance
01	------	None	--------

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Self enhancement, Openness to change, Self transcendence & Conservation.

7.0 Books Used and Recommended to Students

Text Books
a. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1

b. The Teacher‟s Manual “ Manual for A Foundation Course in Human Values and Professional Ethics”, R R Gaur, R Asthana, G

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)
14. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
16. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
18. A N Tripathy, 2003, Human Values, New Age International Publishers
. 19. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
21. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
23. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Web links and Video Lectures (e-Resources):

- Value Education websites,
- https://www.uhv.org.in/uhv-ii,
- http://uhv.ac.in,
- http://www.uptu.ac.in
- Story of Stuff,
- http://www.storyofstuff.com
- https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
- https://fdp-si.aicte-india.org/8dayUHV_download.php
- https://www.youtube.com/watch?v=8ovkLRYXIjE
- https://www.youtube.com/watch?v=OgdNx0X923I
- https://www.youtube.com/watch?v=nGRcbRpvGoU
- https://www.youtube.com/watch?v=sDxGXOgYEKM

9.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals
1	Al Gore, An Inconvenient Truth, Paramount Classics, USA
2	**Charlie Chaplin, Modern Times, United Artists, USA**
3	IIT Delhi, Modern Technology – the Untold Story
4	Gandhi A., Right Here Right Now, Cyclewala Productions.

10.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks **(20 marks out of 50)** and for the SEE minimum passing mark is 35% of the maximum marks **(18 out of 50 marks)**.

The student is declared as a pass in the course if he/she secures a minimum of 40% **(40 marks out of 100)** in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.

The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned.

The teacher should not conduct two assignments at the end of the semester if two assignments are planned. For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment. The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

11.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion
I	1	Right Understanding, Relationship and Physical Facility.	20%
	2	Understanding Value Education, Self-exploration as the Process for Value Education.	
	3	Continuous Happiness and Prosperity – the Basic Human Aspirations.	
	4	Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.	
II	5	Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body.	20%
	6	Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self.	
	7	Understanding Harmony in the Self, Harmony of the Self with the Body.	
	8	Programme to ensure self-regulation and Health.	
III	9	Harmony in the Family and Society, the Basic Unit of Human Interaction.	20%
	10	'Trust' – the Foundational Value in Relationship.	
	11	'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human	

		Relationship.	
	12	Understanding Harmony in the Society, Vision for the Universal Human Order.	
IV	13	Harmony in the Nature/Existence Understanding Harmony in the Nature.	20%
	14	Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature.	
	15	Realizing Existence as Co-existence at All Levels.	
	16	The Holistic Perception of Harmony in Existence.	
V	17	Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values.	20%
	18	Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order.	
	19	Competence in Professional Ethics Holistic Technologies.	
	20	Strategies for Transition towards Value-based Life and Profession.	

12.0 QUESTION BANK

1. What is the state of liking and a holistic and all encompassing state of the mind that creates inner harmony?
   a. Prosperity
   b. **Happiness**
   c. Innateness
   d. Self-organized

2. What is called living with assumption for oneself as body and Living of human beingonly on the basis of physical facilities, and not with right understanding and relationship?
   a. Human Consciousness
   b. Happiness
   c. Right Understanding
   d. **Animal Consciousne**

3. Five basic guidelines for value education are Universal, Natural and verifiable, all encompassing, leading to harmony and
   1. Self exploration
   2. Education
   3. Right utilization
   4. **Rational**

4. What are the basic desires of every human being for which they are working.
   1. Physical facilities
   2. Realization and understanding
   3. Happiness and prosperity
   4. **Continuous happiness and prosperity**

5. When we participate in the larger order, this participation at different levels is known as our value. Values are outcome of
   1. Prosperity
   2. Happiness
   3. **Realization and understanding**
   4. Self exploration

6. Identify the solution which helps human being to transform from animal consciousness tohuman consciousness.
   1. **Right understanding**
   2. Realization
   3. Value education

4. Physical facilities.

7. To maintain harmony we have to work at four levels of living .Identify second level of living.
1. Self
2. **Family**
3. Nature
4. Society

8. Self exploration is a process which helps us to find out "What I am and What I reallywant to be ".Two mechanisms involved in self -exploration are
1. Realization and understanding
2. Natural and verifiable
3. **Natural acceptance and experimental validation**
4. Correctable and identifiable

9. Self exploration uses two mechanisms
1. **Natural acceptance and experiential validation**
2. Right Understanding and self exploration
3. Self investigation and self exploration
4. Natural acceptance and self investigation

10. Samridhi means
1. Happiness
2. Wealth
3. **Prosperity**
4. Health

11. What is the third level of living?
1. **Society**
2. Individual
3. Family
4. Nature

12. Developed nations are the live example of
1. **Prosperity**
2. Wealth
3. Happines
4. Health

13. The participation of human beings is seen in two forms
1. Prosperity and Work
2. Values and Understanding
3. Behavior and Wealth
4. **Behavior and Work**

14. What are the outcomes of realization and understanding?
1. Work
2. **Values**
3. Happiness
4. Health

15. We become …….. by exploring our svatva and living accordingly

a. **Svatantra**
b. Partantra
c. Wealthy.
d. Happy

16.Developed nations are the live example of health, wealth and wisdom. These three term scan be
16.combined to form a single term as

a. Developed
b. **Prosperous**
c. Harmony
d. Happy

17. Contents of self-exploration area

a. Desire and needs
b. Program and needs
c. Program and practical
d. **Desire and Program**

18. Value education is becoming important for students now a days because value education helps students to correctly identify our

a. Values
b. Key to success
c. **Aspirations**
d. Needs

19. Three results are obtained from realization and understanding. Two of them are assurance and satisfaction find third one

a. **Universality**
b. Acceptance
c. All-encompassing
d. Self-verification

20. The person who are lack of physical facility stands for

a. Samadhan viheen dukhi daridra
b. Sadhan viihin dukhi daridra
c. **Sadhan Viheen Dukhi Daridra**
d. Sadhan vimukh dukhi daridra

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	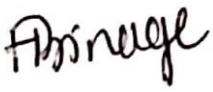	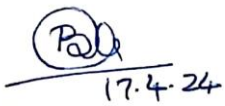 17.4.24	
Prof. S. G. Huddar	**Prof. H. R. Zinage**	**HOD**	**Principal**